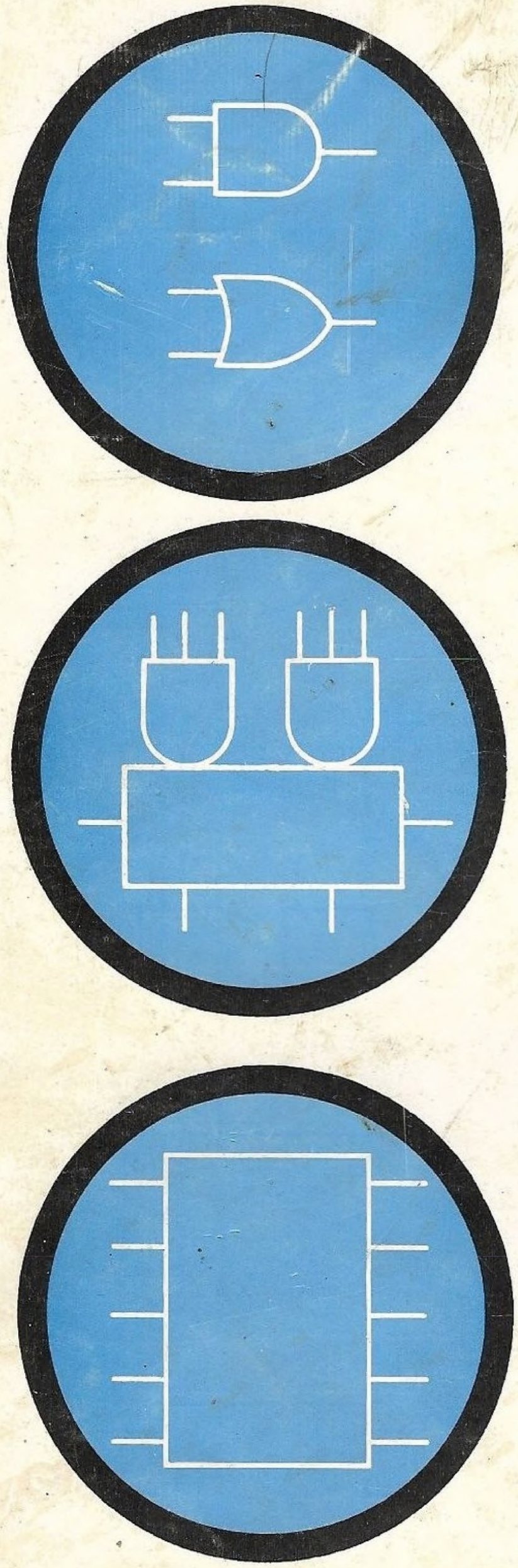
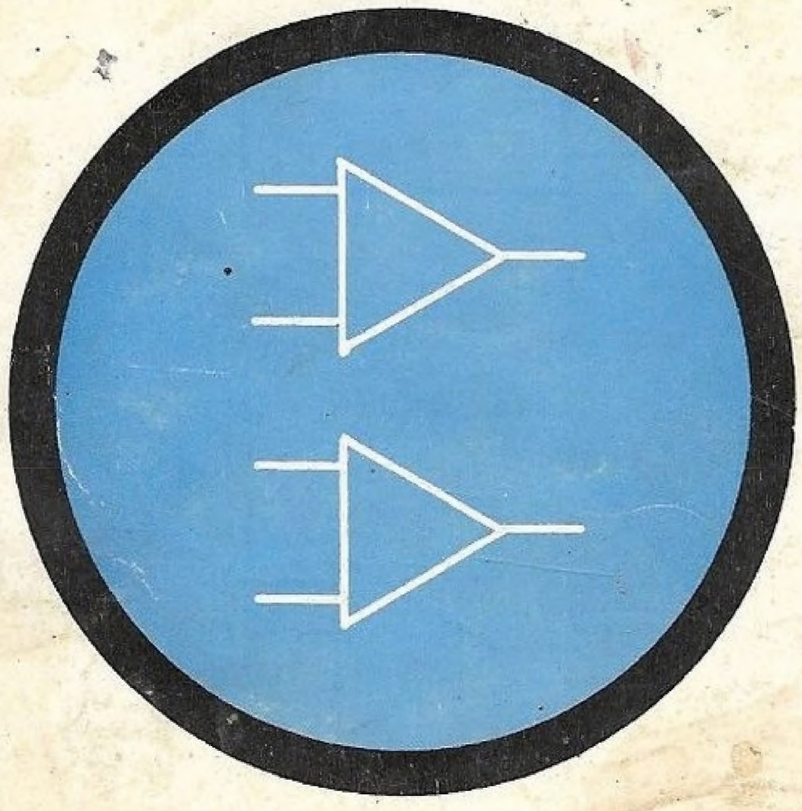
Short-Form
Catalog
IND-803F



SPRAGUE INTEGRATED and THIN-FILM HYBRID CIRCUITS



SPRAGUE PRODUCTS COMPANY

(DISTRIBUTOR'S SUPPLY SUBSIDIARY OF SPRAGUE ELECTRIC COMPANY)

NORTH ADAMS, MASSACHUSETTS

INDEX

INTEGRATED CIRCUITS FOR CONSUMER ENTERTAINMENT AND COMMUNICATION APPLICATIONS

Device Description	Type Number*
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F-M Detector and Limiter	ULN-2113A, ULN-2113N
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F-M/I-F Gain Block	ULN-2131M
F-M Detector and Limiter w/VR	ULN-22136A, ULN-2136N
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F-M Detector and Limiter	ULX-2213A, ULX-2213N

Device Description	Type Number*
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Dual 2-Watt Power Audio Amplifier	ULN-2276P, ULN-2276Q
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A-M SYSTEMS	
A-M Radio	ULN-2137A, ULN-2137N

*Devices prefixed with the letters "ULX" are presently being fabricated in Sprague Electric's pilot plant facilities. When these devices are transferred to regular production lines, the type number will be prefixed by the letters "ULN."

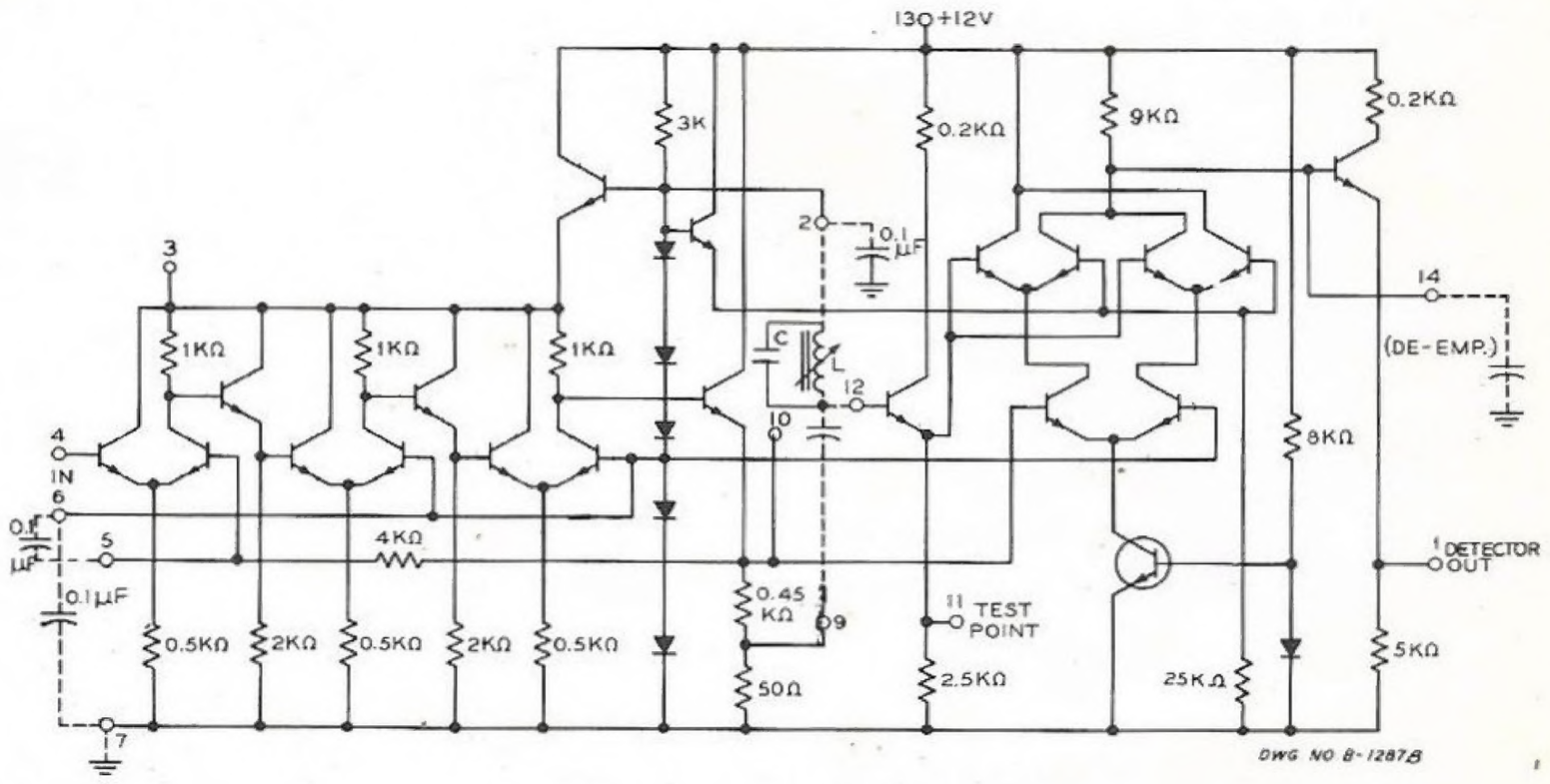
F-M DETECTOR AND LIMITER

SN 76643
ULN-2111A
ULN-2111N
TAA 930

Comprised of a three-stage limiter and a balanced product detector, the Type ULN-2111 finds wide application in TV sound channels, f-m receivers, automatic frequency control systems and communication receivers, radar, etc.

FEATURES

- 55dB Min. High Voltage Gain to 30 MHz
- 150 to 400 μV Threshold
- Zener Diode Power Supply Regulation
- 12 Volt Nom. Supply Voltage
- Operating Temperature Range: 0 C to + 70 C
- 600 mVrms Recovered Audio at 4.5MHz
- Plastic Package (14-pin)
  ULN-2111A Dual In-Line EA
  ULN-2111N Quad In-Line EN



LINEAR INTEGRATED CIRCUITS (continued)

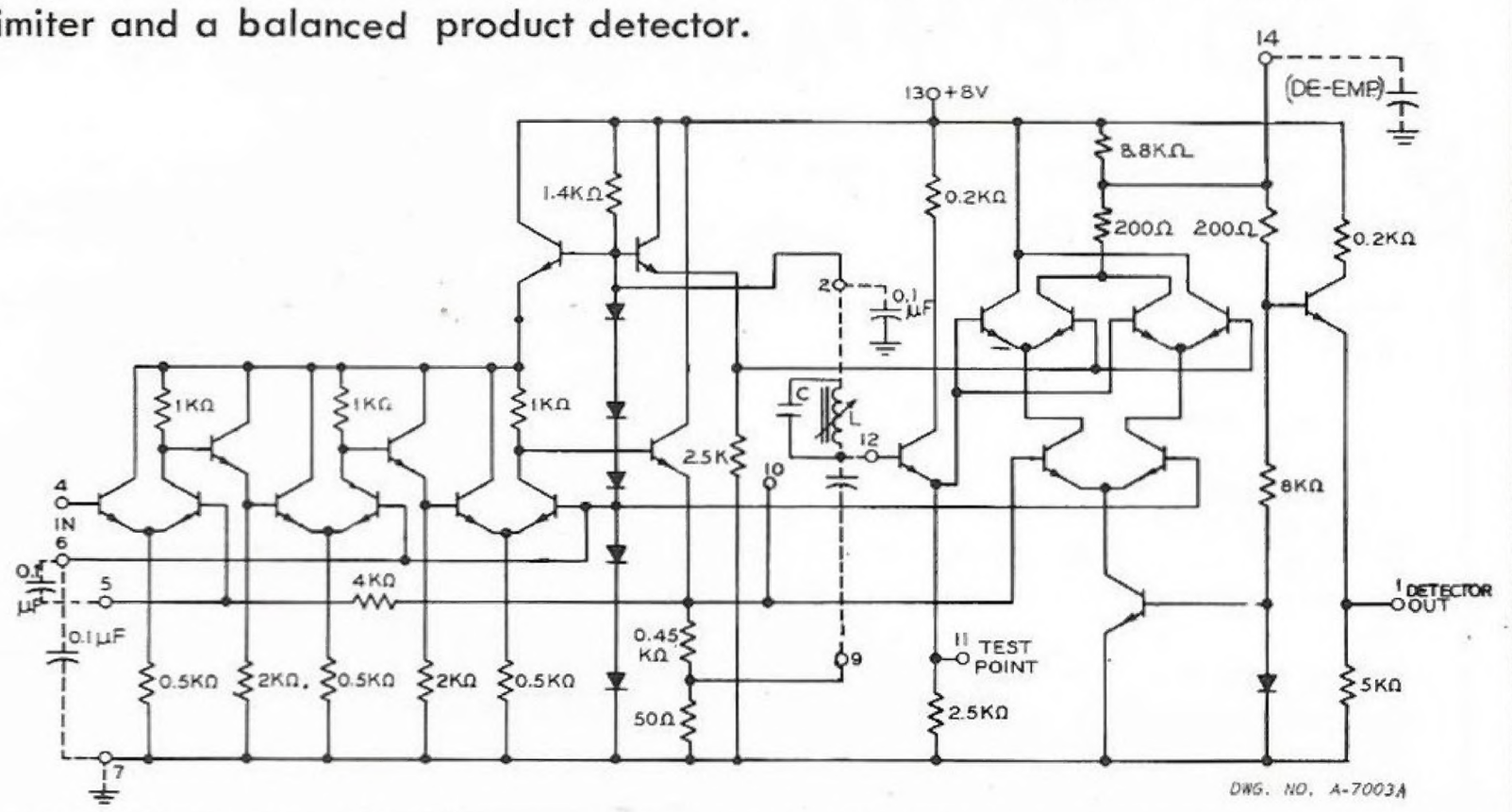
F-M DETECTOR AND LIMITER

ULN-2113A
ULN-2113N

The Type ULN-2113 F-M Detector and Limiter is designed for use with nominal 8 volt supplies in portable or mobile operation. The device consists of a three-stage limiter and a balanced product detector.

FEATURES

- Single Coil Tuning
- High Gain to 50 MHz
- Battery Operation
- Low Distortion, 1.0%
- High Sensitivity-Input
  Limiting Voltage 300μV
- Operating Temperature Range:
  0 C to +70 C
- Plastic Package (14-pin):
  ULN-2113A Dual In-Line EA
  ULN-2113N Quad In-Line EN



CHROMA DEMODULATOR

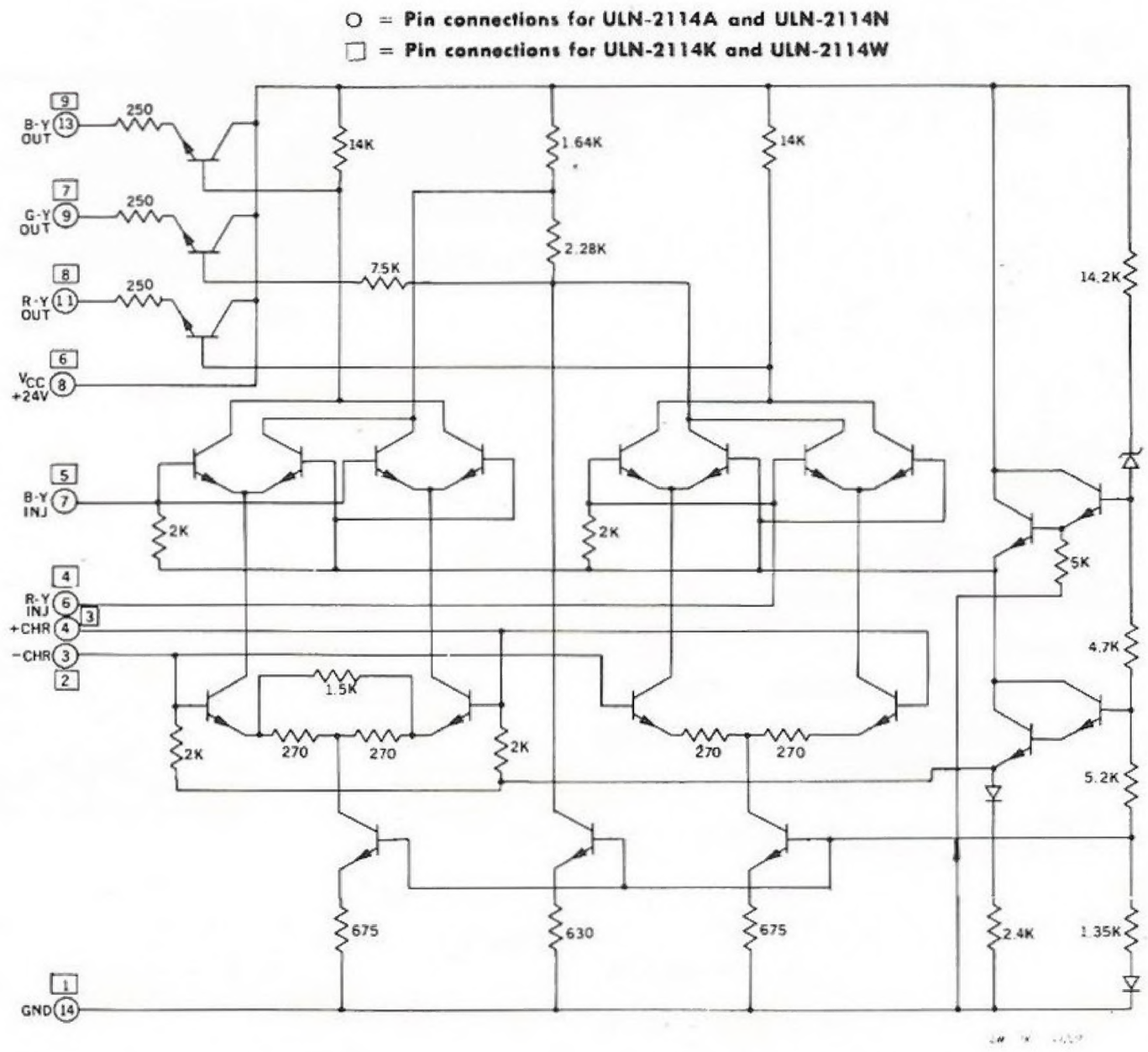
ULN-2114A
ULN-2114K
ULN-2114N
ULN-2114W

Designed to provide the color difference signals in a color television receiver, these Chroma Demodulators employ two fully-balanced quadrature detectors, operating simultaneously, to recover the blue and red information from the 3.58MHz chroma subcarrier.

The Type ULN2114, when used in conjunction with the Type ULN-2124 Chroma Subcarrier Regeneration System and the Type ULN-2127 Chroma Amplifier, constitutes a complete chroma system for color TV receivers.

FEATURES

- Low Thermal Drift, Typically
  5mV/°C
- Doubly Balanced Demodulation
- Internal Color Difference Matrix for
  NTSC Color TV
- 10 Volt Peak-to-Peak B-Y Output
- Excellent Rejection of Chroma Sub-carrier
- Operating Temperature Range: 0 C to +70 C
- Plastic Package (14-pin):
  ULN-2114A Dual In-Line EA
  ULN-2114N Quad In-Line EN
- TO-100 Package:
  ULN-2114K Package BK
  ULN-2114W Package KW



STEREO PROCESSING INTEGRATED CIRCUITS

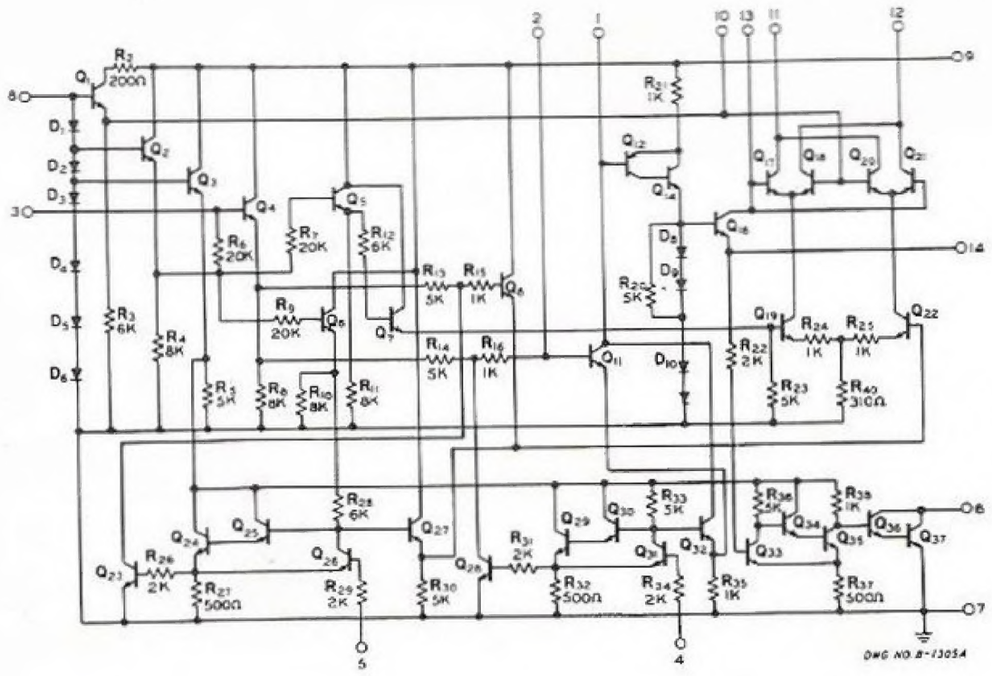
ULN-2120A **ULN-2120N**
ULN-2121A **ULN-2121N**
ULN-2122A **ULN-2122N**
ULN-2128A **ULN-2128N**

These stereo processing circuits are compatible with the Types ULN-2111, ULN-2113, ULN-2129, ULN-2136, and ULN-2213 F-M Detectors and Limiters. The functional capabilities are outlined below.

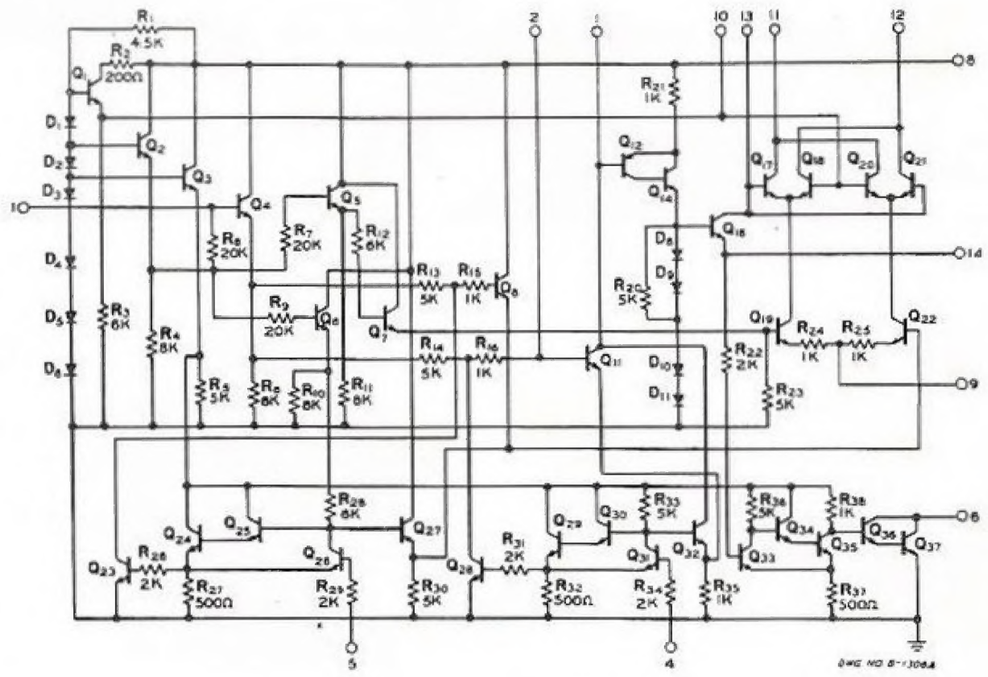
FEATURES

- Reduced Switching Transients
- Improved Ultrasonic Attenuation
- Better Low Level Separation
- Operating Temperature Range 0 C to +70 C
- Plastic Package (14-pin):
  Suffix A: Dual In-Line EA
  Suffix N: Quad In-Line EN

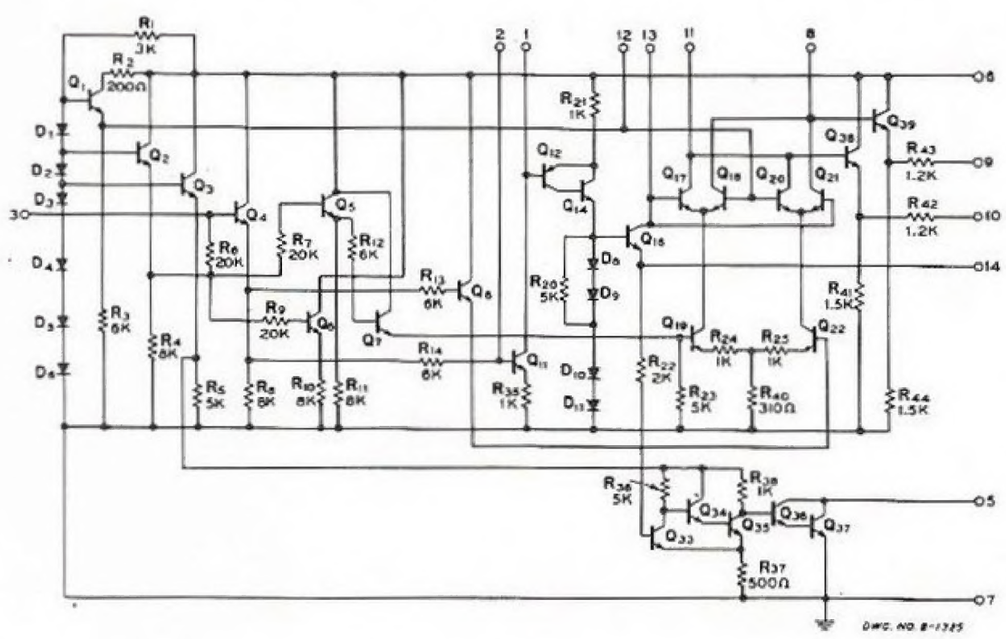
Device Type	19kHz Amplifier	Frequency Doubler	Stereo Indicator Lamp Driver	Audio Mute	Stereo/ Monaural Switch	Stereo Demodulator	Adjustable Stereo Channel Separation	Other Functions Available Emitter-Follower Outputs
ULN-2120A/N	Yes	Yes	Yes	Yes	Yes	Yes	No	No
ULN-2121A/N	Yes	Yes	Yes	No	No	Yes	No	Yes
ULN-2122A/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
ULN-2128A/N	Yes	Yes	Yes	No	No	Yes	No	No



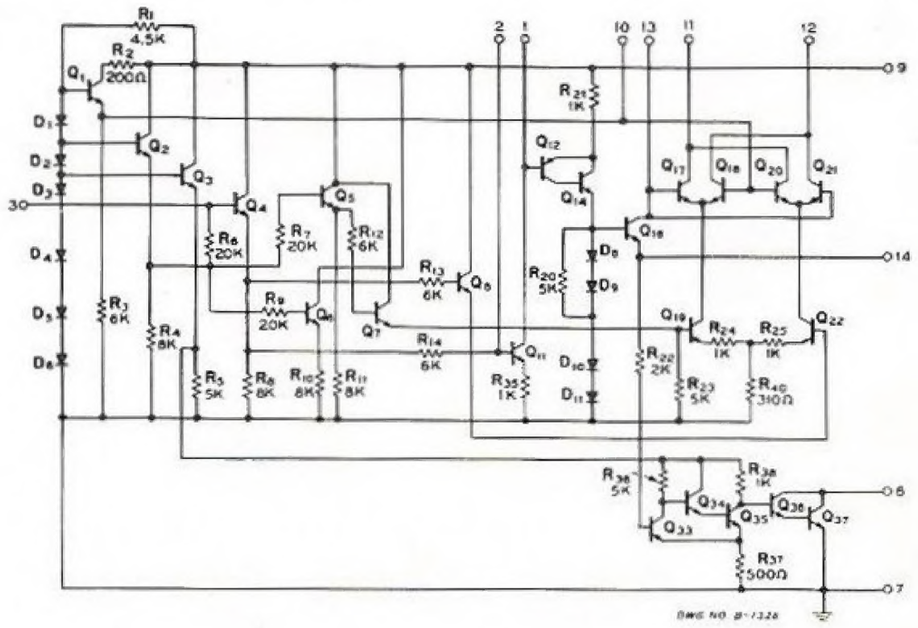
ULN-2120



ULN-2122



ULN-2121



ULN-2128

CHROMA OSCILLATOR

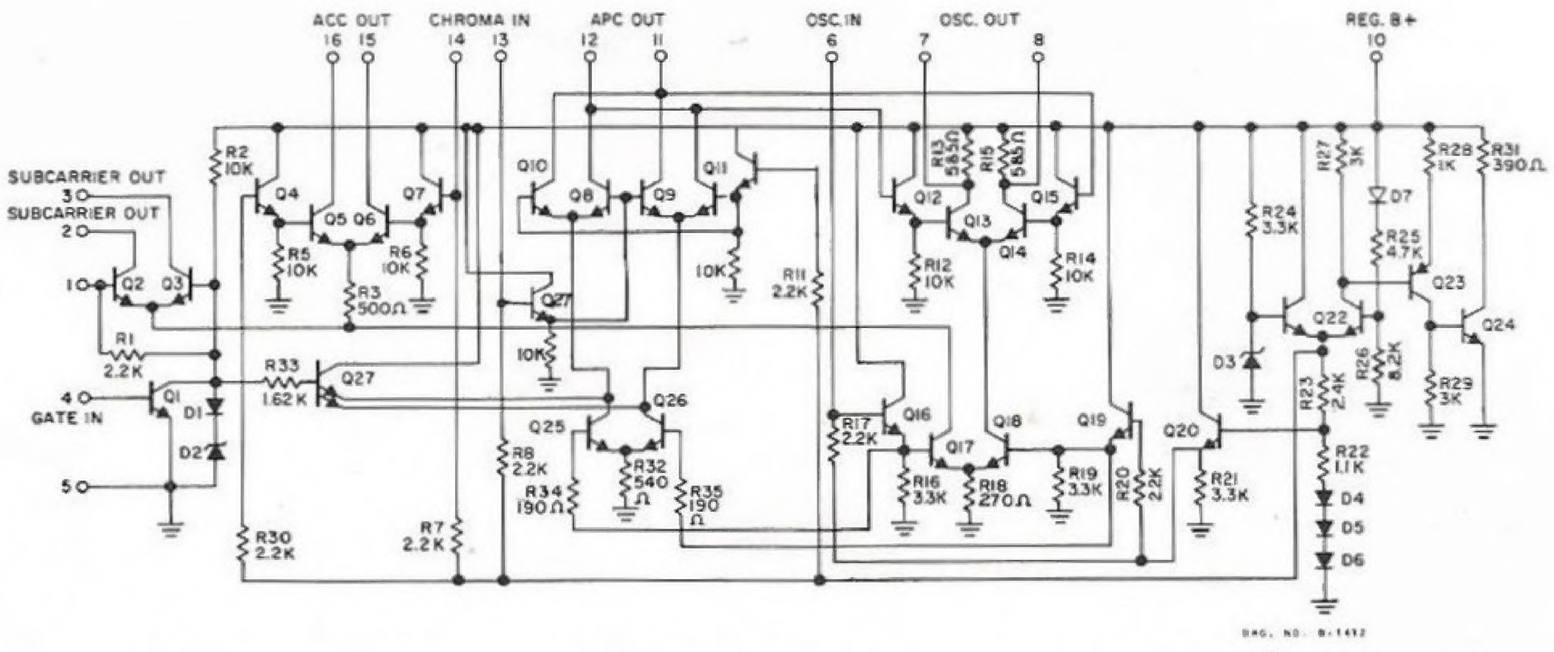
μA 780
ULN-2124A
MC 1370
CA 3070

The Type ULN-2124 Chroma Subcarrier Regeneration System is a linear monolithic integrated circuit designed for use in television receivers.

The Type ULN-2124, when used in conjunction with the Type ULN-2114 Chroma Demodulator and the Type ULN-2127 Chroma Amplifier, constitutes a complete chroma system for color TV Receivers.

FEATURES

- Shunt Regulator
- D-C Hue Control
- Phase Locked Oscillator
- Keyed Automatic Phase-Control Detector
- Operating Temperature Range: −40 C to +85 C
- Plastic Package (16-pin): ULN-2124A Dual In-Line EA



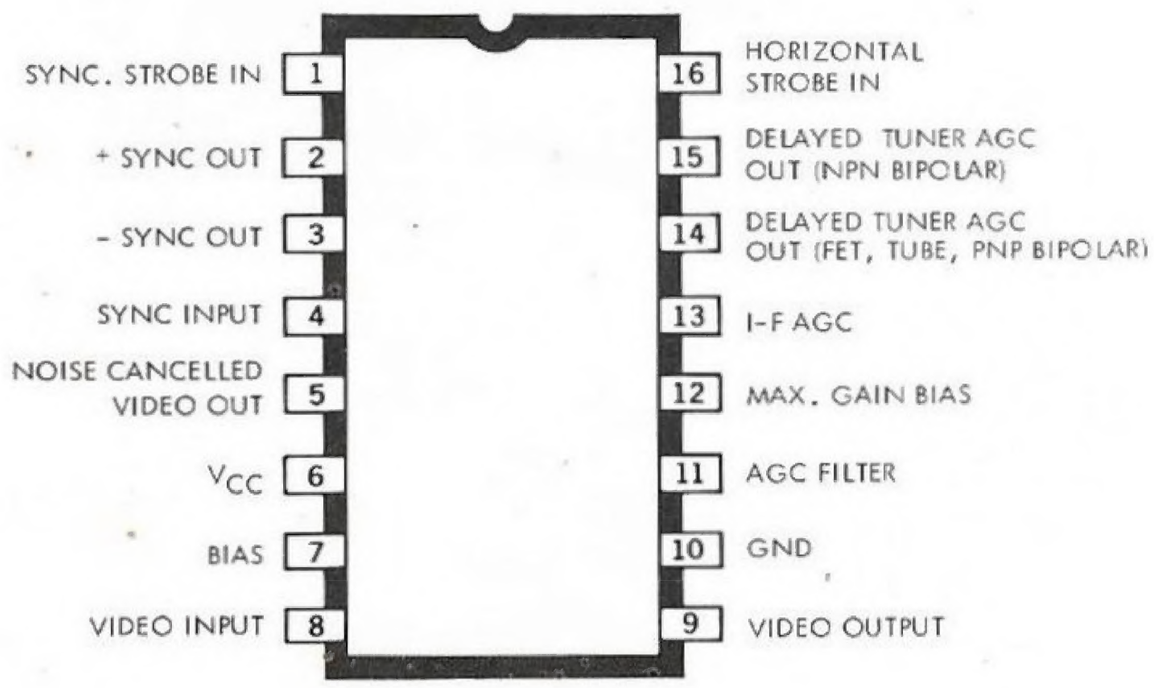
VIDEO SIGNAL PROCESSOR

ULN-2125A

Designed for use in television receivers, the Type ULN-2125 monolithic integrated circuit provides a video driver, noise cancelled sync separator with dual polarity outputs, a gated noise cancelled AGC detector, and outputs for both i-f and bipolar/FET tuners.

The Type ULN-2125 operates from a single +24 Volt supply and is fully short-circuit protected. AGC and noise thresholds are internally derived on the chip.

- Plastic Package (16-pin): ULN-2125A Dual In-Line EA



DUAL PREAMPLIFIER

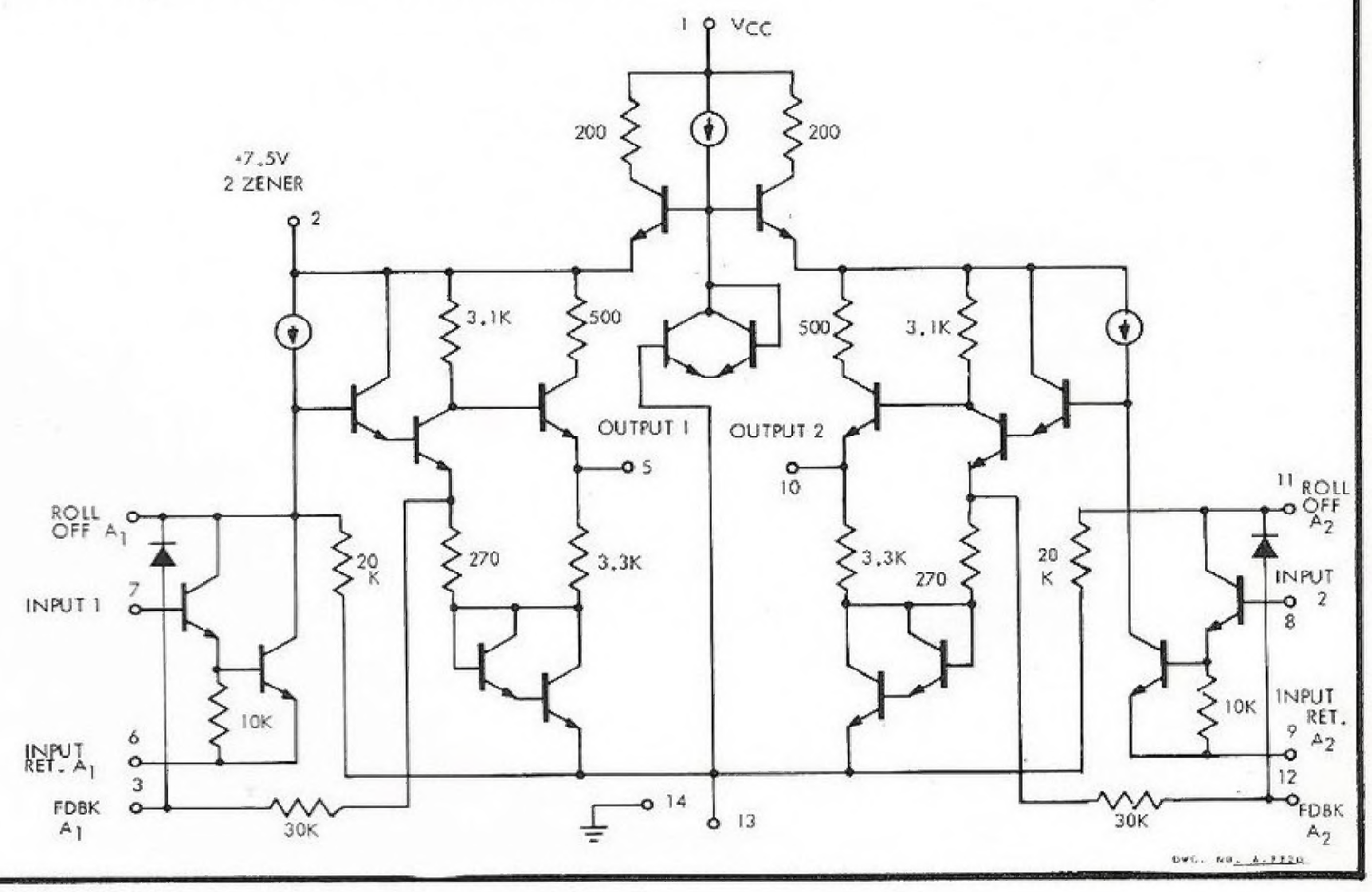
ULN-2126A

ULN-2126N

The Type ULN-2126 Dual Preamplifier is a linear monolithic circuit designed for use with low-level signals in low-noise applications. It offers outstanding value, performance, and reliability in both consumer and industrial products such as stereo tape players/recorders, dictating equipment, movie projectors, record players, microphone amplifiers and f-m stereo receivers.

FEATURES

- Internal Voltage Regulator
- No Audio or R-F Decoupling Required
- 60 dB Channel Separation
- 65 dB Gain per Channel
- Single Power Supply Operation: $V_{CC} = 12V$
- High Input Impedance: 250KΩ Typ.
- Wide Power Supply Range: 12 to 24V
- Matched Open Loop Voltage Gain
- Turn-On Delay
- Operating Temperature Range:
  −30 C to +85 C
- Plastic Package (14-pin):
  ULN-2126A Dual In-Line EA
  ULN-2126N Quad In-Line EN



CHROMA AMPLIFIER

~~μA 781~~

ULN-2127A

ULN-2127N

~~MC 1371~~

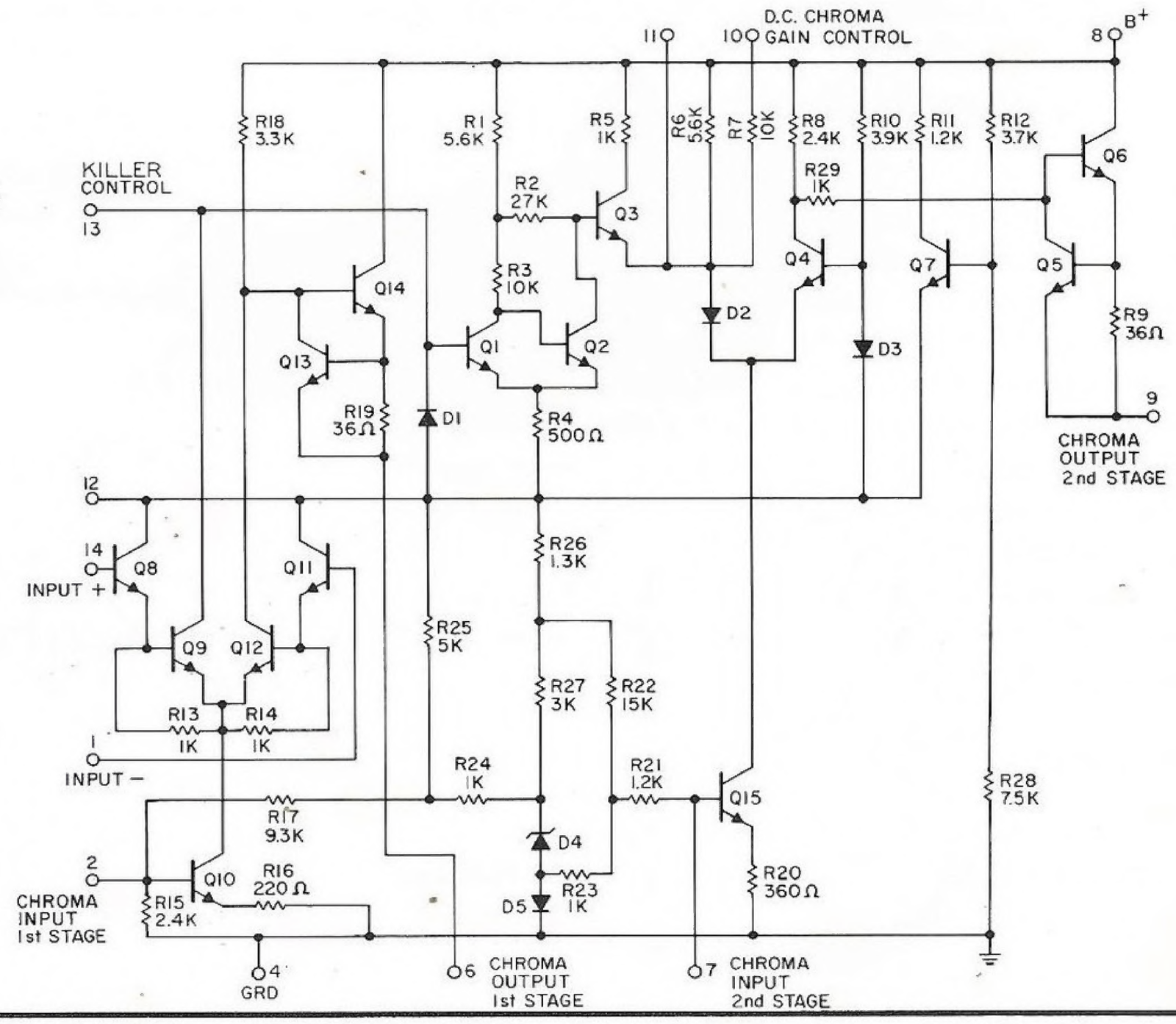
~~CA 3071~~

The Type ULN-2127 Chroma Amplifier is a linear monolithic integrated circuit designed for use in television receivers. The device is a two-stage chroma amplifier and functional control circuit.

When used in conjunction with the Sprague Type ULN-2114 Chroma Demodulator and Type ULN-2124 TV Subcarrier Regeneration System, the Type ULN-2127 constitutes a complete chroma system for color TV receivers.

FEATURES

- Color Kill
- D-C Chroma Gain Control
- AGC Controlled Chroma Amplifier
- Amplifier Short-Circuit Protection
- Operating Temperature Range:
  −40 C to +85 C
- Plastic Package (14-pin):
  ULN-2127A Dual In-Line EA
  ULN-2127N Quad In-Line EN



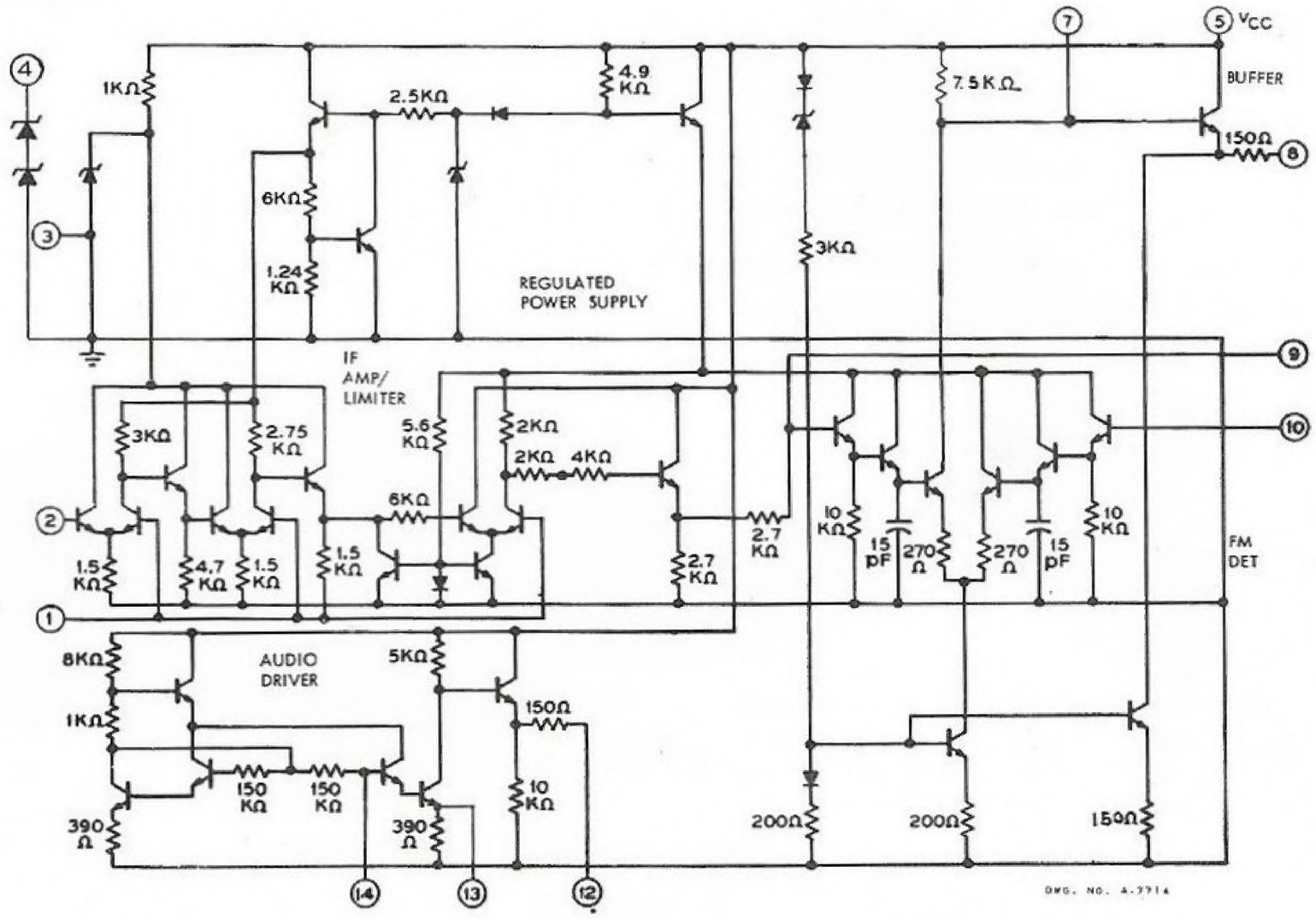
F-M SOUND CHANNEL

ULN-2129A
ULN-2129N

The Type ULN-2129 Sound Channel is a linear monolithic integrated circuit designed for f-m applications in communication receivers and high-fidelity receivers. The device consists of a multistage i-f amplifier-limiter section with a Zener regulated power supply, an f-m preamplifier section, and an optional Zener diode power supply regulator.

FEATURES

- Good Sensitivity
- Excellent A-M Rejection
- Low Harmonic Distortion
- Single Coil Tuning
- 60 dB I-F Amplifier
- Low Impedance Output Stage
- Operating Temperature Range:
  −40 C to +85 C
- Plastic Package (14-pin):
  ULN-2129A Dual In-Line EA
  ULN-2129N Quad In-Line EN



F-M /I-F GAIN BLOCK

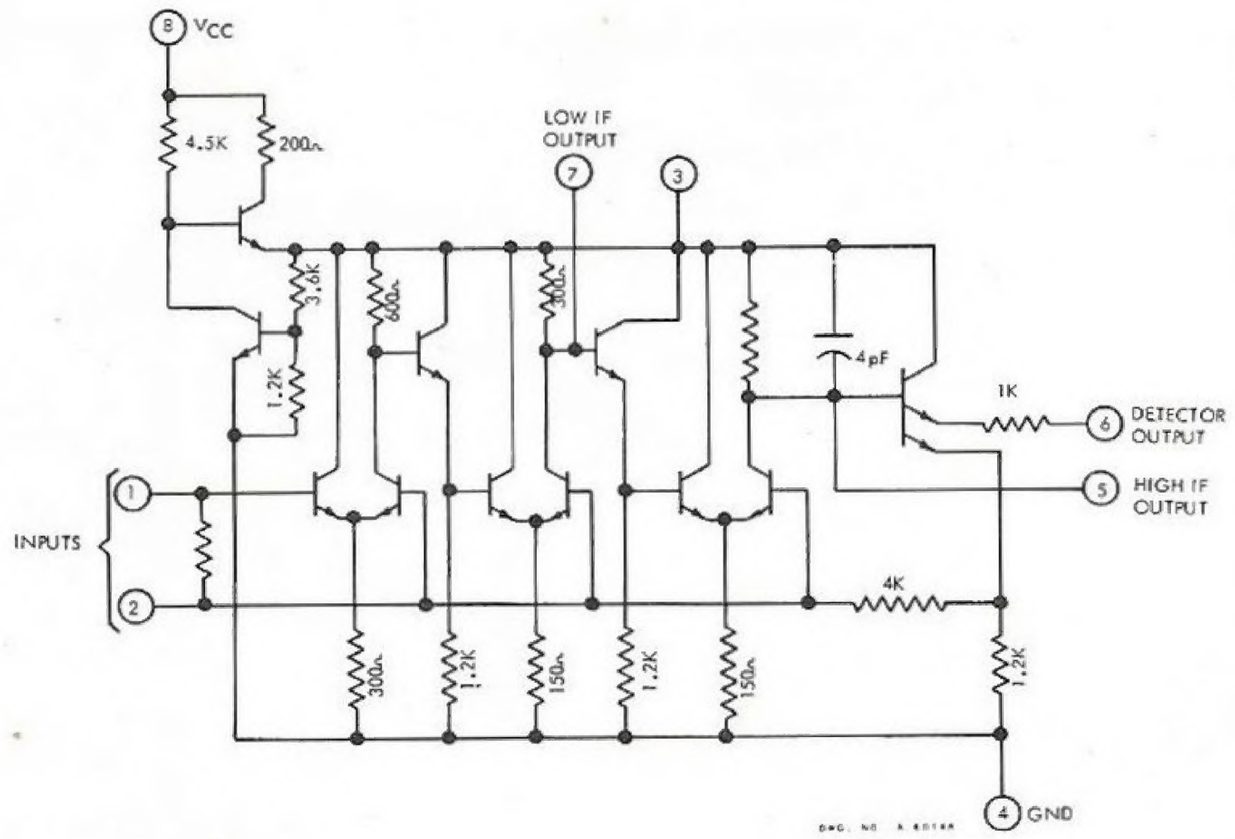
ULN-2131M

The Type ULN-2131 F-M Gain Block Linear Monolithic Integrated Circuit is designed for use in communications and high fidelity f-m receivers. This device consists of a three-stage limiting amplifier section, a regulated power supply, an a-m detector and 330Ω input and output terminations with 7pF shunting capacitance required for 10.7MHz ceramic filters. Gain can be adjusted without effect on input and output conditions by addition of a fixed resistor between pins 3 and 7.

When used with Type ULN-2111 or ULN-2113 F-M Detector/Limiter circuits, sensitivity in the 10 to 15 μV range can be obtained.

FEATURES

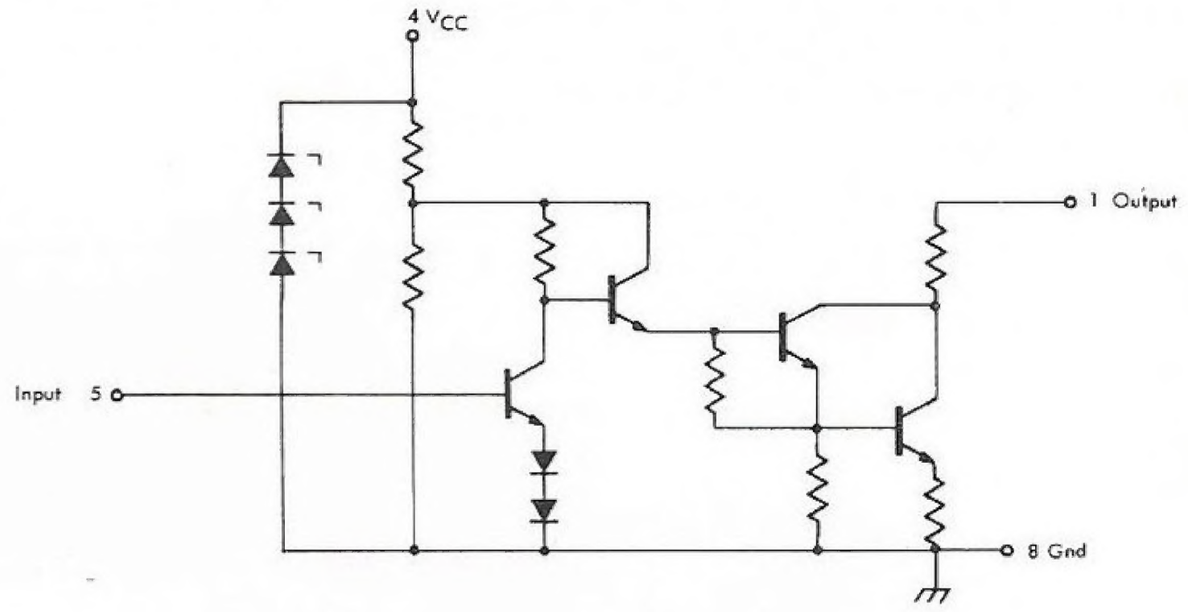
- Operating Temperature Range: −40 C to +85 C.
- Available in the Plastic 8-pin Dual In-Line EM Package.



AUDIO DRIVER

ULN-2135E

The Type ULN-2135 Class "A" Audio Driver is a linear monolithic integrated circuit designed for use in automotive radios and tape players. The device will easily drive most PNP power output transistor stages to full rated output without the need for gain selection of the output transistors. Internal protection against power line surges and transients is provided by zener diodes.



FEATURES

- Low Current Drain 8.5 mA typical
- High Output Sink Current Capability
- Economical Miniature Plastic 4-pin Dual In-Line Package EE
- Operating Temperature Range:
  0 C to +75 C

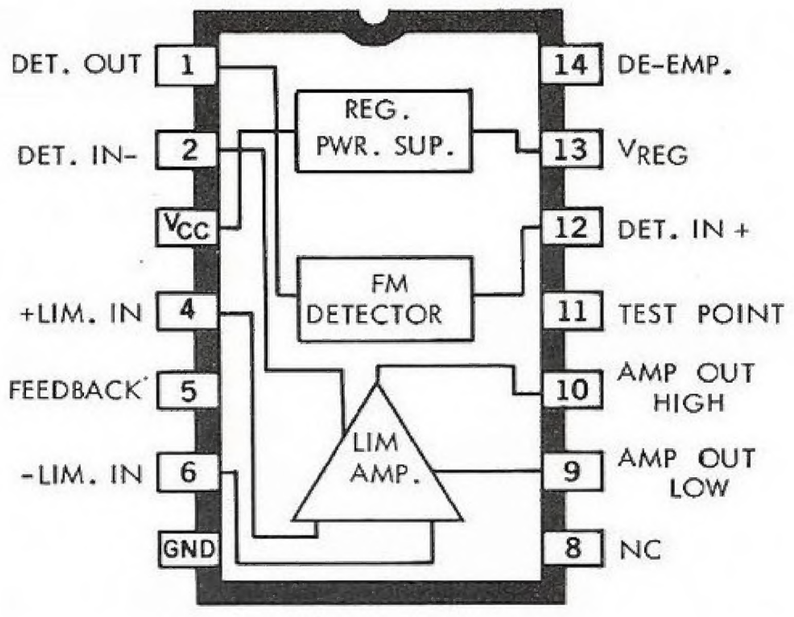
F-M DETECTOR AND LIMITER WITH VOLTAGE REGULATOR

ULN-2136A
ULN-2136N

The ULN-2136 combines a limiting amplifier, quadrature discriminator and a voltage regulator in a single monolithic IC. Although primarily for f-m receivers, the device is quite versatile for use in any f-m demodulator application.

FEATURES

- Improved AFC Stability
- No Detector Unbalance
- Low Harmonic Distortion
- Single Coil Tuning
- Line and Load Regulation
- Operating Temperature Range:
  −25 C to +85 C
- Plastic Package (14-pin):
  ULN-2136A Dual In-Line EA
  ULN-2136N Quad In-Line EN



DWG. NO. A-9059

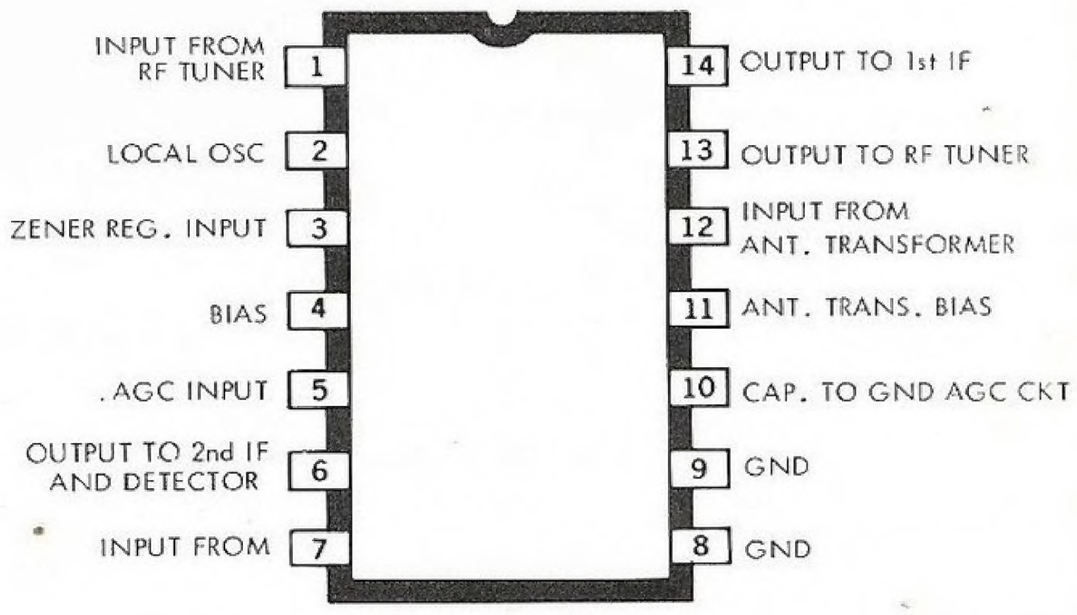
A-M RADIO

ULN-2137A
ULN-2137N

PL 1820
LM 1820
CA 3123
MA 720

The Type ULN-2137 monolithic integrated circuit is ideal for use in a-m radio design. It provides the function of r-f/i-f amplification.

- Plastic Package (14-pin)
  ULN-2137A Dual In-Line EA
  ULN-2137N Quad In-Line EN



TV SOUND CHANNEL

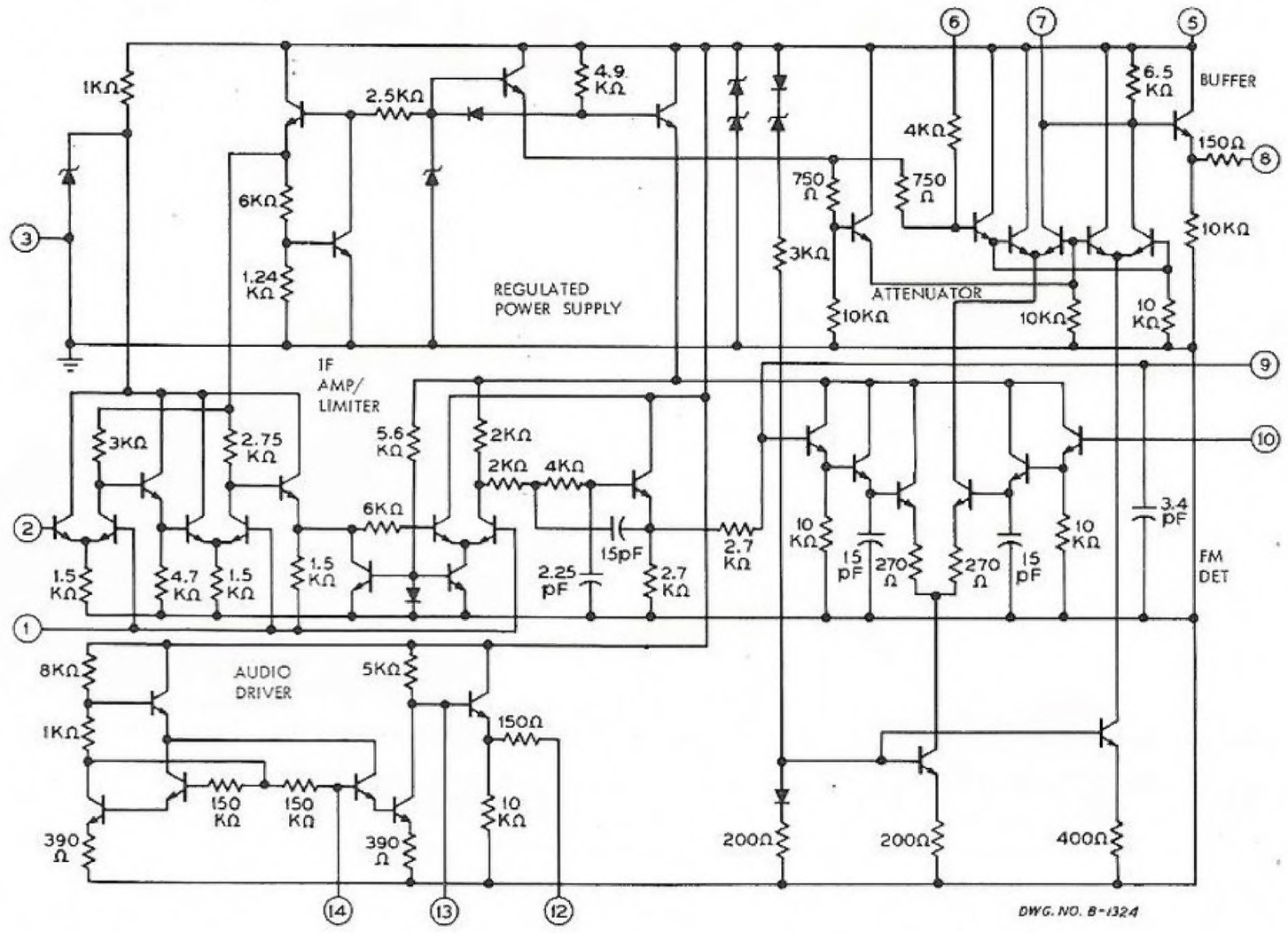
ULN-2165A

ULN-2165N

MC 1358

CA 3065

The ULN-2165 Sound System contains a multi-stage i-f amplifier limiter, an FM detector, an electronic attenuator, a zener diode regulated power supply, and an audio amplifier-driver.



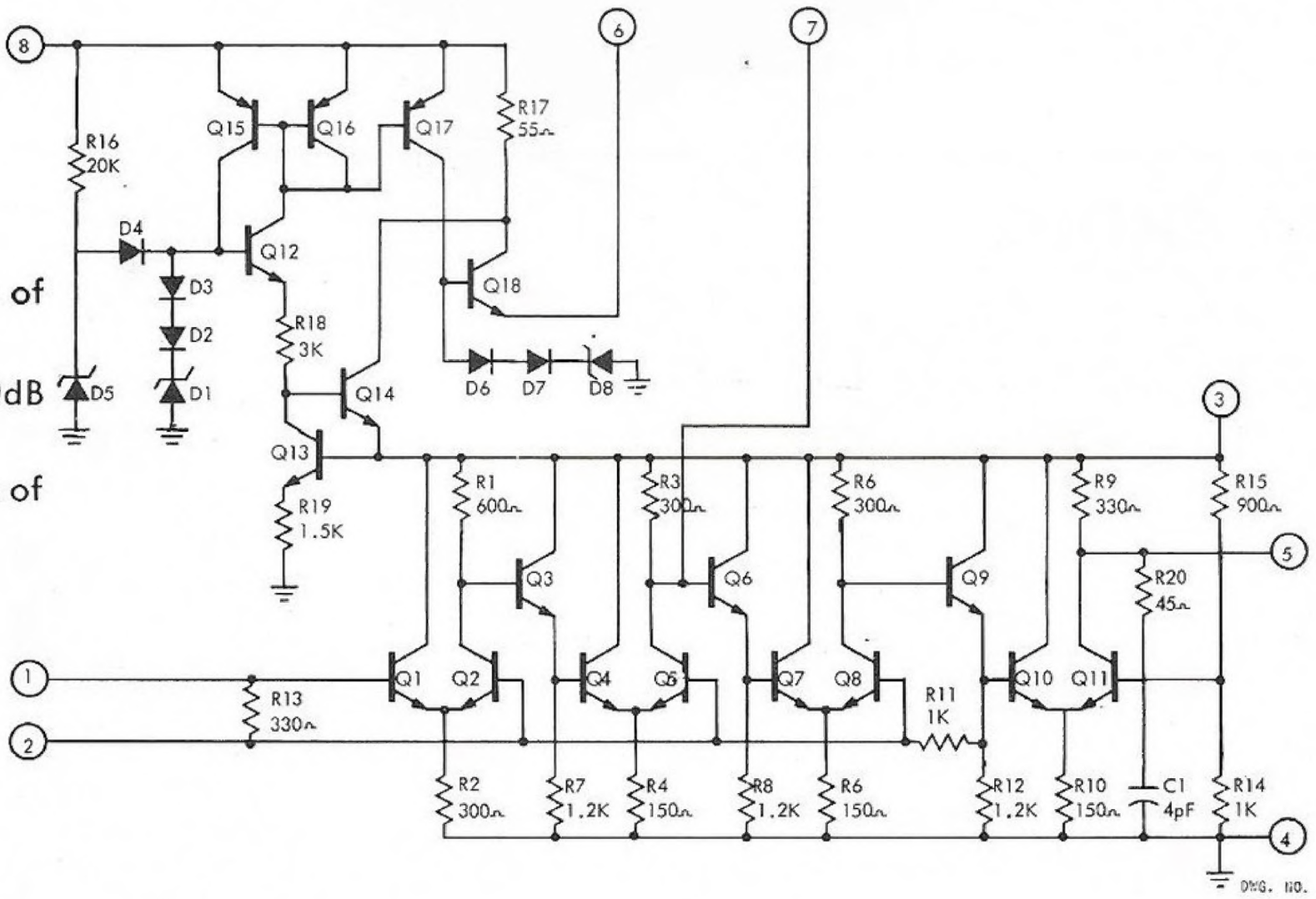
I-F GAIN BLOCK WITH VOLTAGE REGULATOR

ULN-2209M

The Type ULN-2209 provides the function of an f-m gain block and is designed for use in communications and f-m receivers. The device consists of a four-stage limiting amplifier, a regulated power supply, and 330Ω input and output terminations with 7pF of shunt capacitance required for 10.7 MHz ceramic filters. The Type ULN-2209 offers a 7.7 Volt regulated supply for external use from Pin 6. This device is available in the 8-lead dual-in-line "M" package.

FEATURES

- Typical Power Gain at 10.7MHz of 50dB
- Power Supply Rejection Ratio (40dB typical)
- Operation Over a Voltage Range of 10V to 20V
- Excellent Temperature Stability
- Operating Temperature Range: −40 C to +85 C



TV SOUND CHANNEL—2-WATT OUTPUT

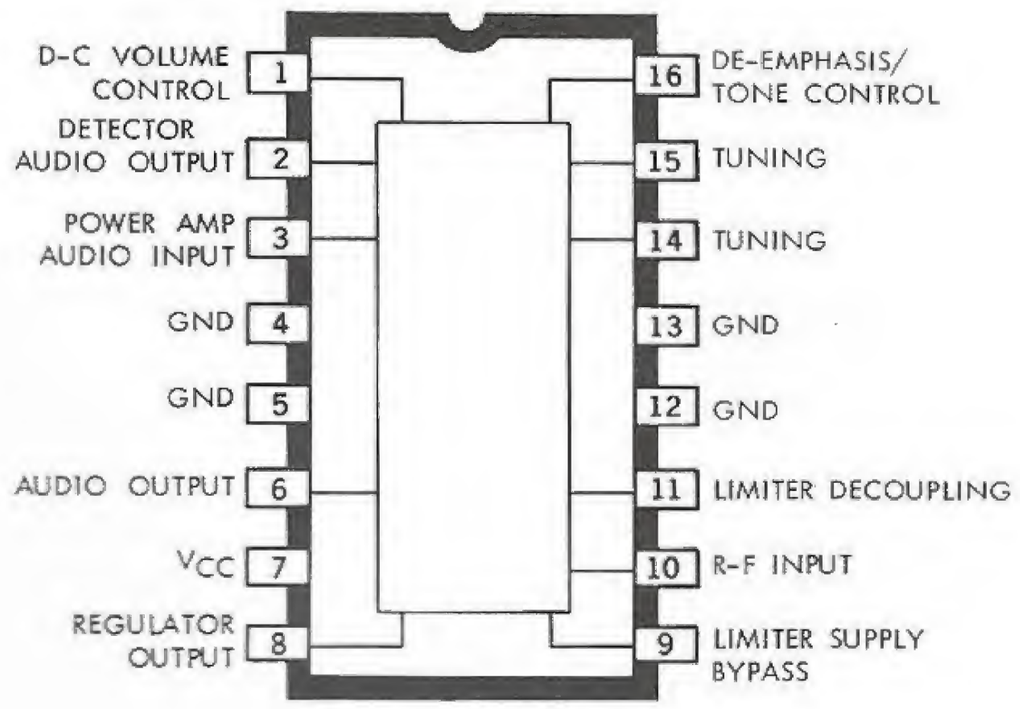
ULX-2211A

The Type ULX-2211 is a monolithic integrated circuit designed for use as the entire sound function in television receivers. The device will directly drive an 8 or 16 ohm speaker and provide a true undistorted (THD < 2%) 2-Watt output. The Type ULX-2211 features operation from a single 18-30 volt supply while providing $V_{CC}/2$ output tracking and greater than 40 dB of ripple rejection.

A minimum external component count of seven capacitors and one d-c volume control completes the sound function of the receiver. The Type ULX-2211 is available in the 16-lead dual-in-line "A" package.

FEATURES

- D-C Volume Control Attenuation, 80dB Typ.
- Limiter Gain of 75dB
- Limiting Threshold Typically Less Than 100 μV
- Automatic Thermal Shutdown
- Over Current Limiting
- Operating Temperature Range:
  0°C to +85°C



DWG. NO. A-9238

F-M DETECTOR AND LIMITER

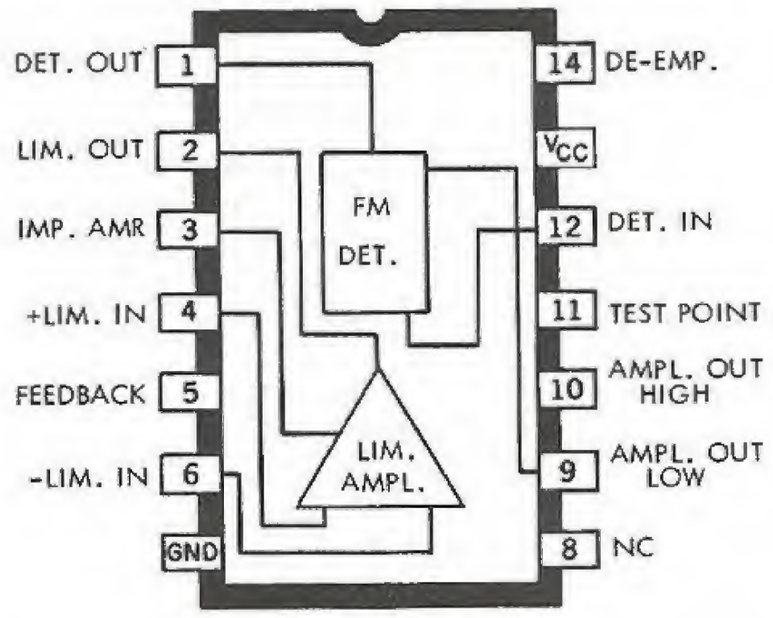
ULX-2213A

ULX-2213N

The Type ULX-2213 combines a three-stage limiting-amplifier and balanced quadrature discriminator in a single monolithic integrated circuit. The Type ULX-2213 is a pin-for-pin replacement for the Type ULN-2111 and ULN-2113 and has improved temperature coefficient of the detector output for better AFC stability.

FEATURES

- Direct Drive Capability for Single Channel Ic, Audio Amp, or Transistor Output Stage.
- Single Coil Tuning
- Low Harmonic Distortion
- Supply Voltage Range: 8V-20V Nom.
- Operating Temperature Range:
  −25 C to +85 C
- Plastic Package (14-pin)
  ULX-2213A Dual In-Line EA
  ULX-2213N Quad In-Line EN



DWG. NO. A-9053

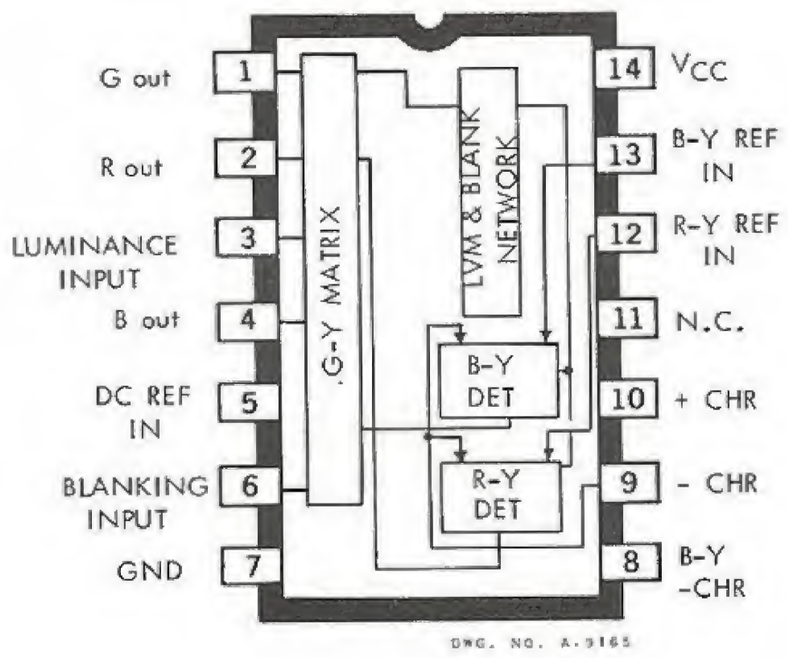
CHROMA DEMODULATOR

ULX-2226A
ULX-2226N

The Type ULX-2226 combines a dual doubly-balanced chroma demodulator with R-G-B output matrix and chroma driver stages in a single monolithic integrated circuit. Addition of the luminance input allows the designer to mix the correct amount of the luminance portion of the color signal with the color difference signals to give R-G-B outputs directly. By applying a positive-going blanking signal to pin 6, blanking of the picture during line and frame flyback may be achieved. The Type ULX-2226 is designed for use in solid-state color television receivers and is a pin-for-pin replacement for the MC1326.

FEATURES

- Good Chroma Sensitivity
- D-C Temperature Stability of 3mV/°C typical
- Low Differential Output D-C Offset Voltage (0.6V max.)
- High Blue Output Voltage Swing of 10Vp-p typical
- Plastic Package (14-pin):
  ULX-2226A Dual In-Line EA
  ULX-2226N Quad In-Line EN
- Operating Temperature Range:
  0°C to +75°C



DWG. NO. A-9165

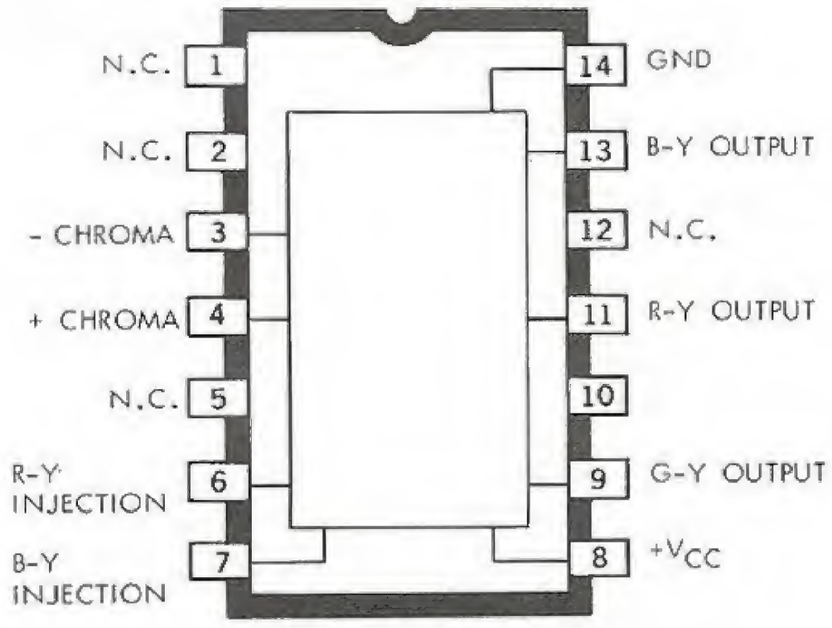
CHROMA DEMODULATOR

ULX-2228A
ULX-2228N

The Type ULX-2228 is a dual doubly balanced chroma demodulator designed to provide the signal difference in a color television receiver. The device is pin compatible with the ULN2114.

FEATURES

- 10 Vp-p Typ. B-Y Output Voltage Swing
- Output Offset Voltage 0.6V Max.
- Negligible Change in Output Voltage Swing with Varying 3.58mHz Reference Signal
- 3mV/°C Typical Temperature Stability
- Good Chroma Sensitivity – 0.3 Vp-p Input Produces 5.0 Vp-p Output
- Operating Temperature Range:
  0°C to +75°C
- Plastic Package (14-pin)
  ULX-2228A Dual in-line EA
  ULX-2228N Quad in-line EN



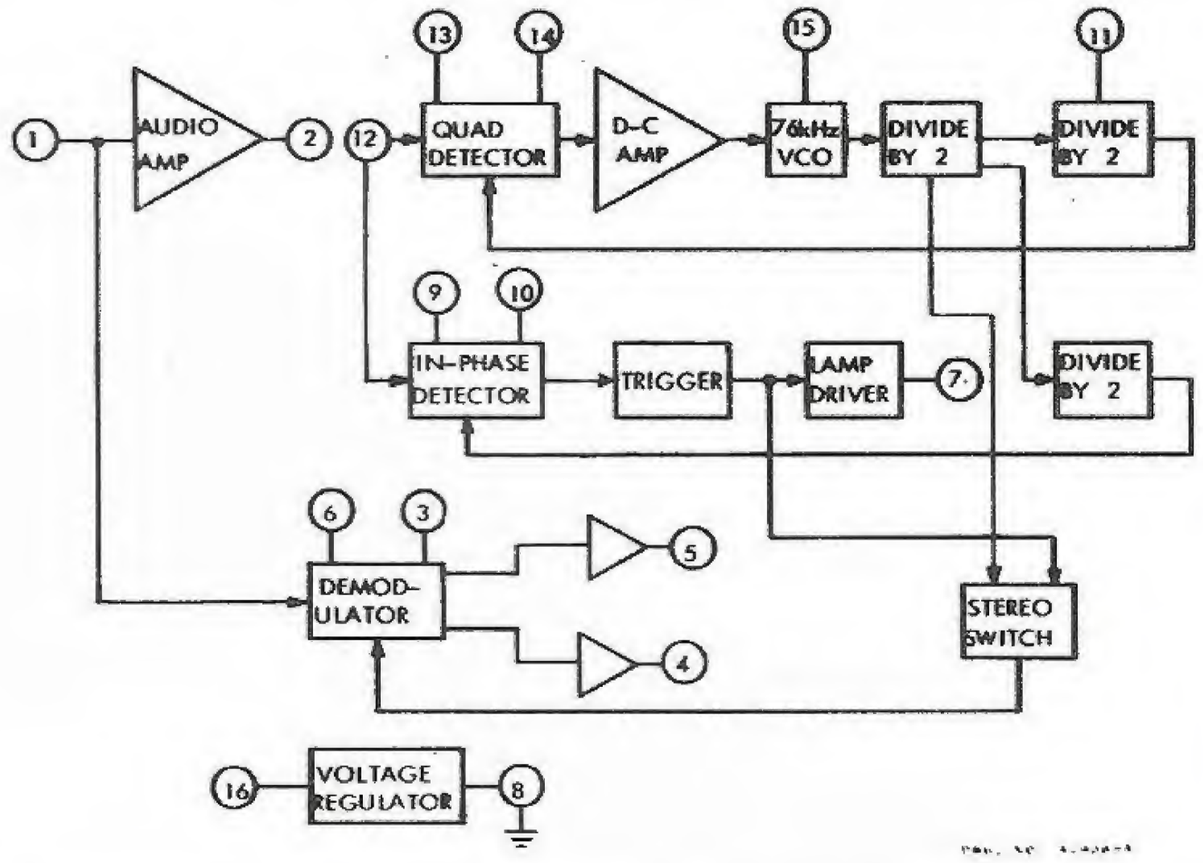
DWG. NO. A-9239

PHASE-LOCKED LOOP STEREO DECODER

ULX-2244A

The Type ULX-2244 features:

- Coiless
- Operating Voltage: 10.5 to 16V
- Operating Temperature Range: −30 C to +60 C
- High Channel Separation
- Low T.H.D.
- High Power Supply Decoupling
- 100mA Lamp Driver Capability
- High V_{CO} Frequency Stability
- High Processing Gain
- Plastic Package (16 pin):
  ULX-2244A Dual In-Line EA



AUTOMATIC FINE TUNER - TV SYSTEMS

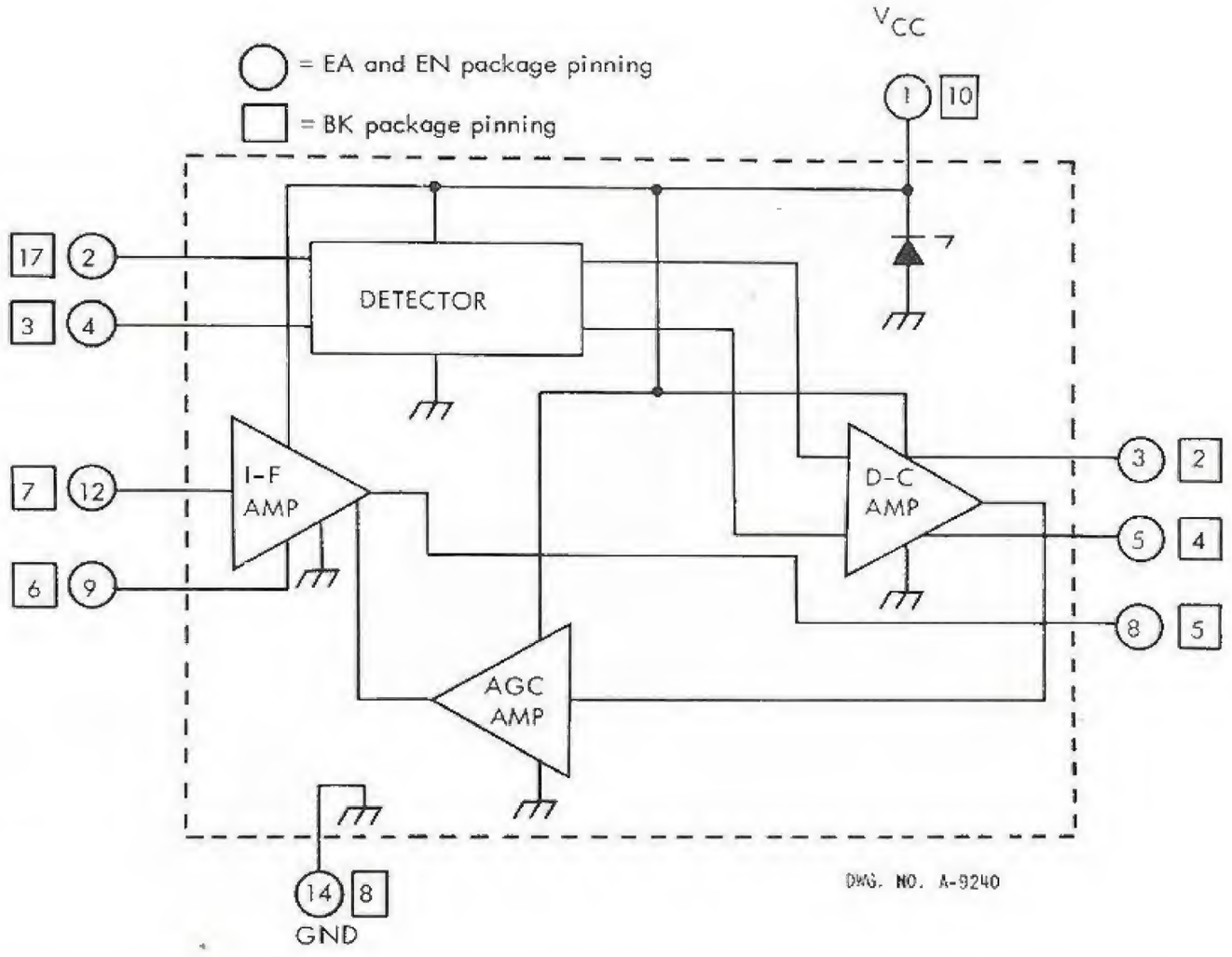
ULX-2264A
ULX-2264K
ULX-2264N

MC 1364
CA 3064

The ULX-2264 is a linear integrated circuit designed primarily for TV automatic fine tuning applications. The device combines all the automatic fine-tuning circuitry, except transformers. The ULX-2264 is a pin-for-pin replacement for the CA3064.

FEATURES

- Internal Voltage Regulator
- Internal AGC
- High Sensitivity
- 25KHz Max. Frequency Deviation
- Operating Temperature Range:
  −40°C to +85°C
- Packages Three Configurations
  ULX-2264A Dual in-line EA
  ULX-2264K TO-100; BK
  ULX-2264N Quad in-line EN



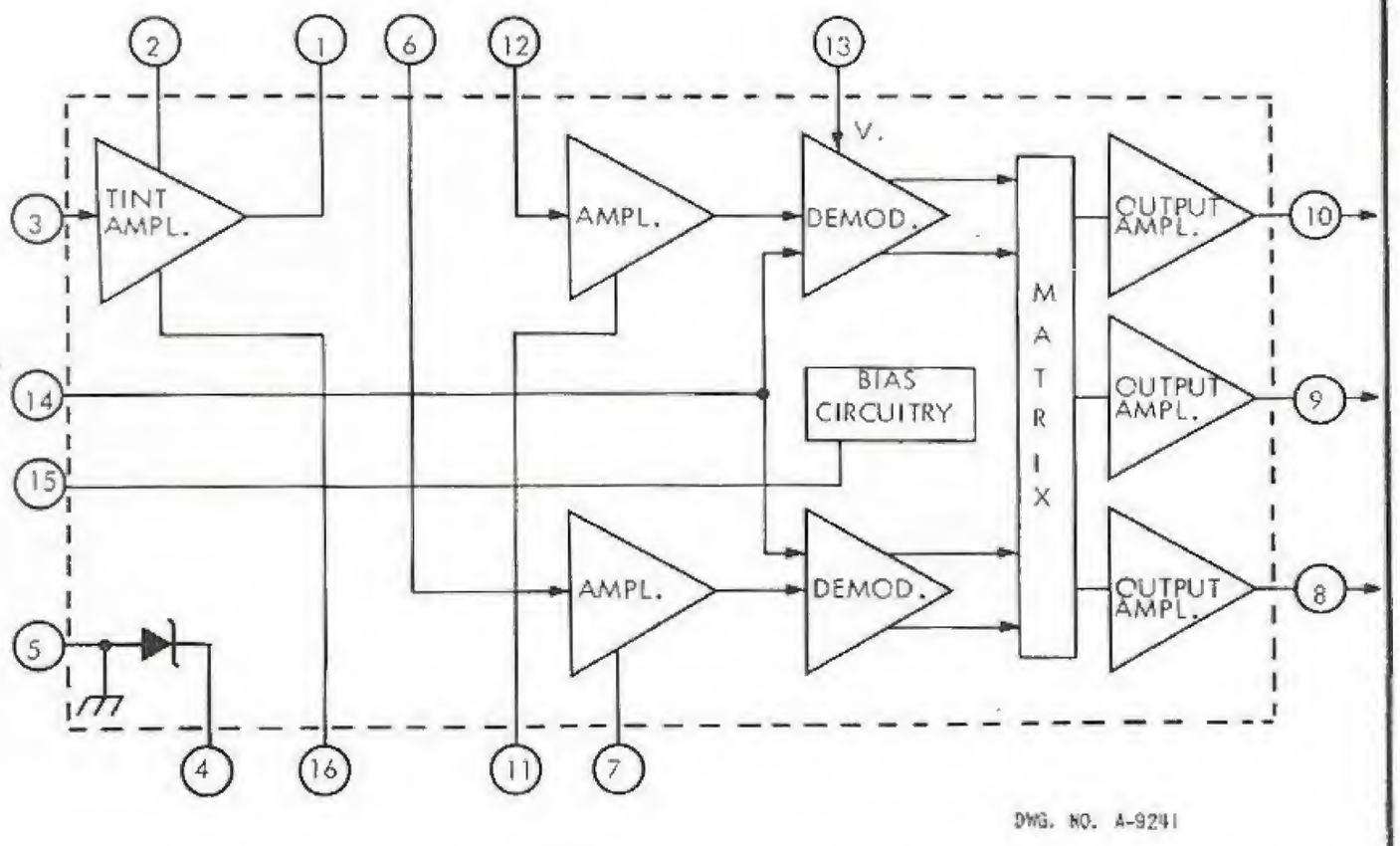
CHROMA DEMODULATOR

ULX-2267A

The ULX-2267A contains the separate functional systems of a d-c tint control and a demodulator. It is a pin-for-pin replacement for the CA3067.

FEATURES

- Balanced Chroma Demodulators
- Color Difference Matrix
- DC Tint Control
- Three Low Output Impedance Drivers for Direct Coupling
- Reference Subcarrier Limiter
- Zener Diode for Regulated Voltage Reference
- Internal RF Filtering
- Operating Temperature Range: −40°C to +85°C
- Plastic 16-Pin Dual In-Line Package EA



DUAL AUDIO AMPLIFIERS

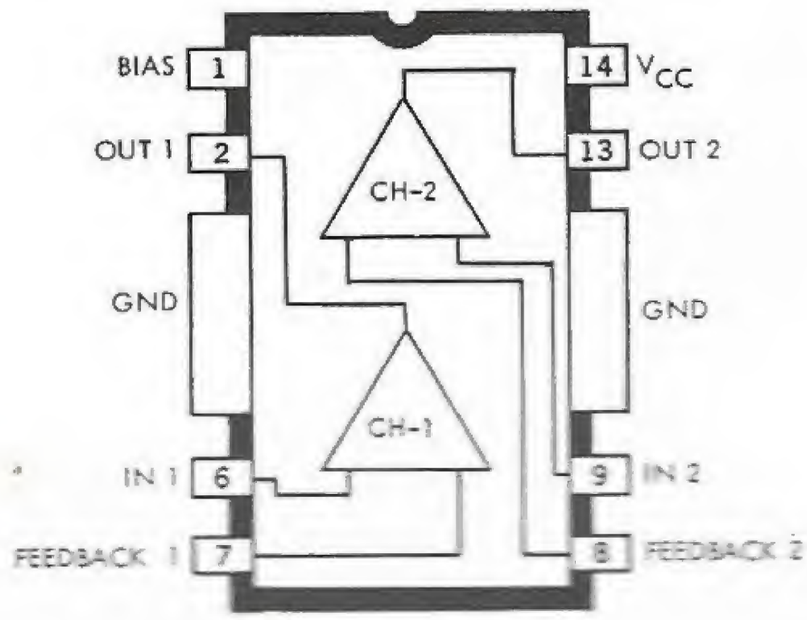
ULN-2275P ULN-2275Q
ULN-2276P ULN-2276Q
ULN-2277P ULN-2277Q

These Dual Audio Amplifiers are linear monolithic integrated circuits designed for use in stereo phonographs, a-m/f-m and stereo receivers, automobile radios, tape players/recorders, intercoms, and movie projectors. With 2 packages a complete quadar system can be constructed.

Type Number	Power Rating per Channel (Watts)	V_{CC} (Volts) Nom.	Max.	R_L (ohms)
ULN-2275	1	14	20	8
ULN-2276	4	26	40	8
ULN-2277	2	18	30	8

FEATURES

- High Channel Separation: 55dB Typ.
- High Open Loop Gain: 72dB Typ.
- Power Supply Decoupling: 50dB Typ.
- High Input Resistance: 3MΩ Min.
- Internal Compensation Capacitors
- Operating Temperature Range: 0 C to +70 C
- Heat-Sinked Plastic Packages:
  - Suffix P: Dual In-Line EP
  - Suffix Q: Quad In-Line EQ

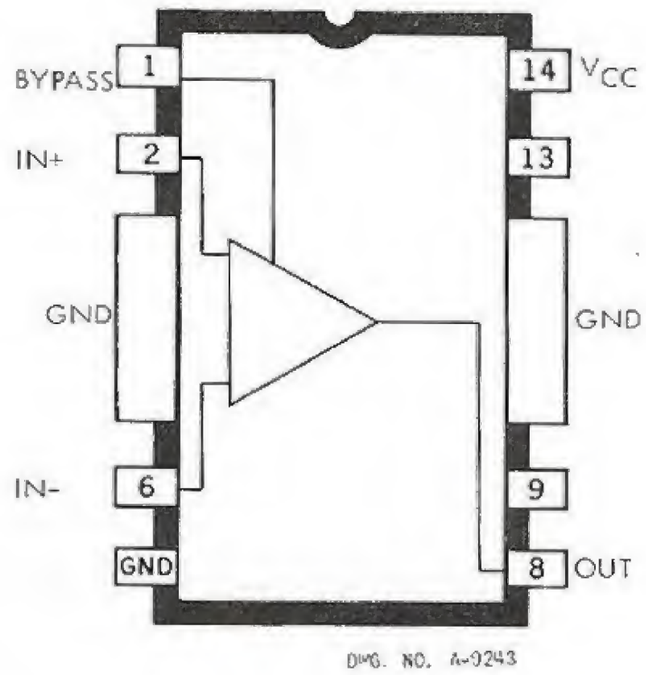


POWER AUDIO AMPLIFIERS

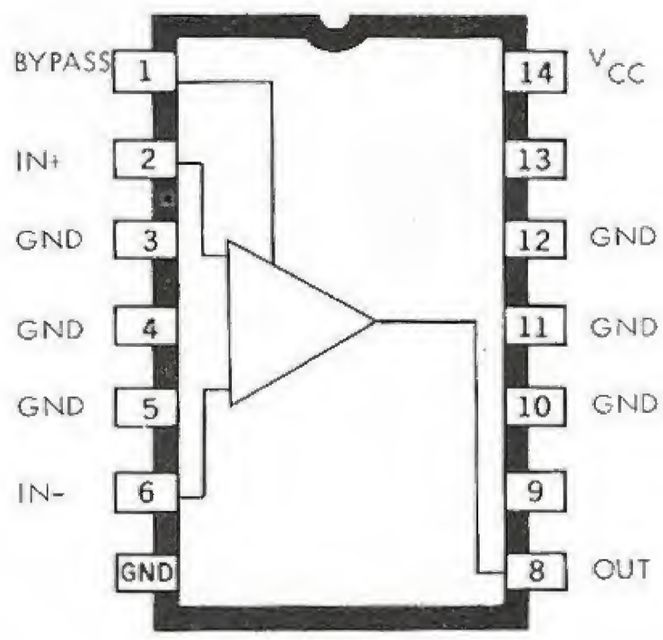
TYPE ULX-2280A: 1 to 3 Watts
TYPE ULX-2280P: 3 to 5 Watts

The ULX-2280A and ULX-2280P Power Audio Amplifiers are monolithic integrated circuits designed for minimum external component requirements. They are ideally suited for applications in consumer, automotive and communications designs. To this end the gain is internally fixed at 34dB. Thermal overload protection and output short circuit current limiting insure safe operation in all applications.

- Operating Temperature Range:
  0°C to +70°C
- Plastic Packages:
  ULX-2280A 14-Pin Dual In-Line EA
  ULX-2280P Heat Sinked Dual In-Line EP



DWG. NO. A-9243



DWG. NO. A-9242

SINGLE AUDIO POWER AMPLIFIERS

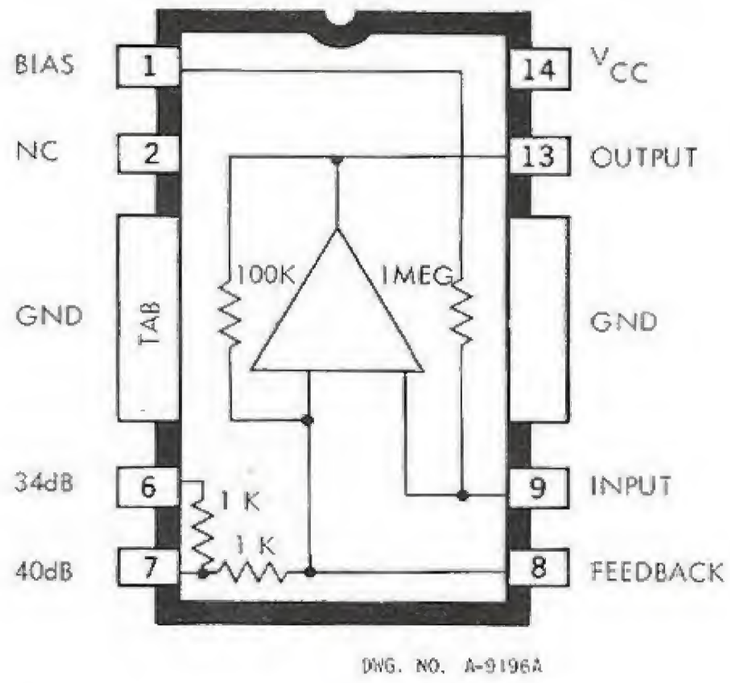
TYPE ULX-2285A: 1 to 3 Watts
TYPE ULX-2285P: 3 to 5 Watts

Type ULX-2285A and ULX-2285P Audio Amplifiers are linear monolithic integrated circuits designed for use in television sound systems, phonographs, a-m/f-m and f-m stereos, auto radios and intercoms. Other applications include instrumentation, motion picture projectors, and special alarm systems.

These versatile amplifiers offer the advantages of standard dual-in-line pin spacing, two individual wattage ratings, and optional gain features of 40dB and 34dB or other combinations.

OTHER FEATURES INCLUDE

- High Input Resistance: 3MΩ typ.
- High Open-Loop Gain: 72dB Typ.
- Power Supply Decoupling: 50dB typ.
- Internal Compensation Capacitors
- Current Limiting
- Power Shutdown



DWG. NO. A-9196A

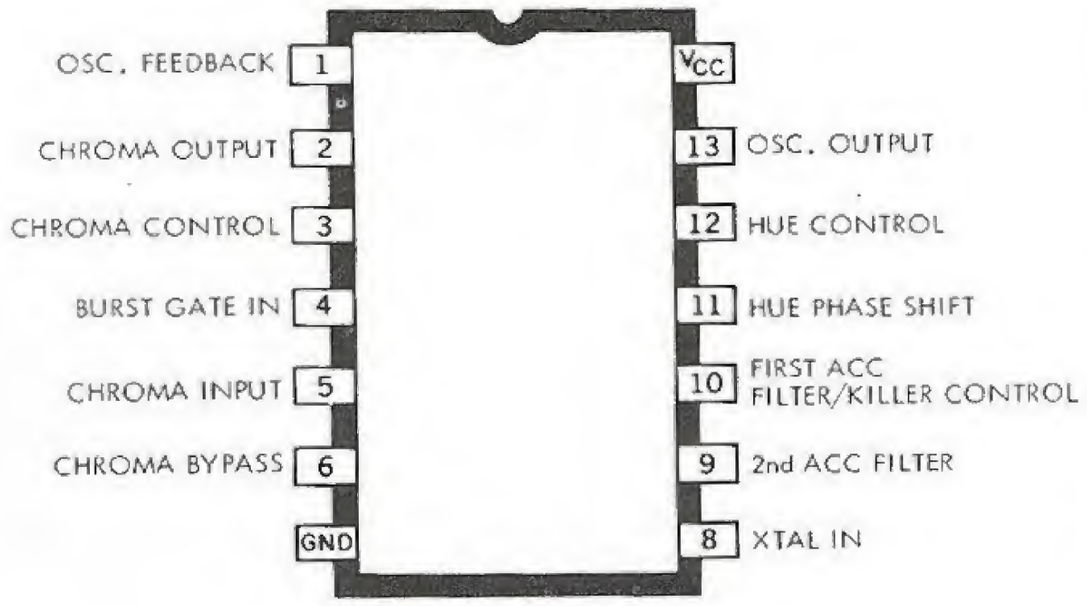
NOTE:
Pinning shown is for the 'P' package. For the 'A' package pin 3, 4, 5, 10, 11, and 12 form the ground leads.

- Operating Temperature Range:
  0°C to +70°C
- Plastic Packages:
  ULX-2285A 14-Pin Dual In-Line EA
  ULX-2285P Heat Sinked Dual In-Line EP

CHROMA PROCESSOR

ULX-2298A
ULX-2298N

The Type ULX-2298 is a linear monolithic integrated circuit designed for use in the newer solid-state color television receivers. It provides the functions of a chroma i-f amplifier with automatic chroma control, color killer, and an injection lock reference system. Both hue shift and chroma amplitude are d-c controlled. The ULX-2298 is a pin-for-pin replacement for the MC1398.



FEATURES

- Built-In Noise Immunity
- Short Circuit Current Protection
- Crystal-Controlled Internal Feedback Oscillator
- Internal Burst Gate and Gate Pulse Shaping Circuit
- High Oscillator Lock-In Sensitivity
- Internal Supply Regulation
- Plastic Package (14 pin)
  - ULX-2298A Dual In-Line EA
  - ULX-2298N Quad In-Line EN

Absolute Maximum Ratings

Horizontal Pulse Input Current . . . . . 250 μA Peak
Power Dissipation* (Package limitation) . . . . . 625 mW
Operating Temperature Range, T_A — 20 C to +75 C
Storage Temperature Range, T_S . . — 65 C to +150 C

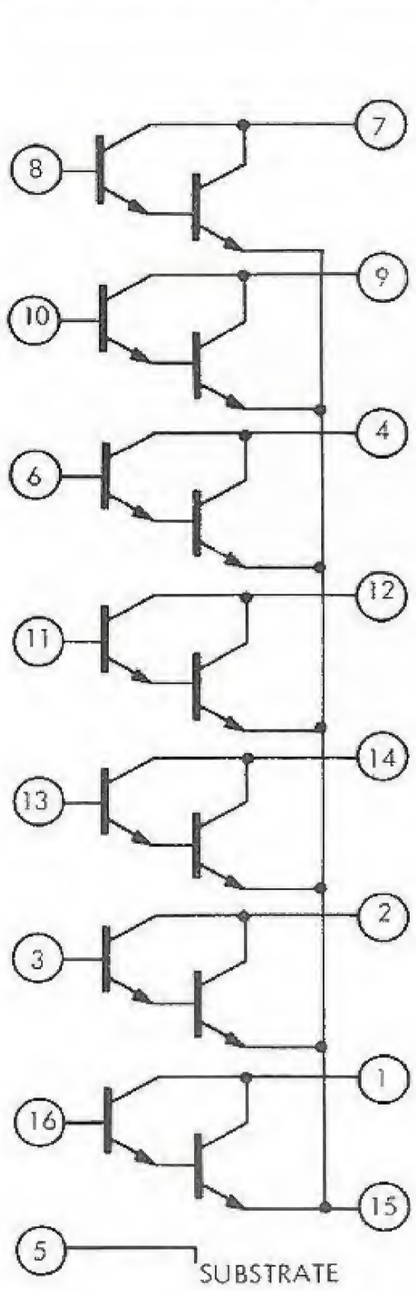
*Derate 5mW/°C above T_A = +25°C

TRANSISTOR ARRAYS

—A NEW APPROACH TO DESIGN PROBLEM SOLVING—

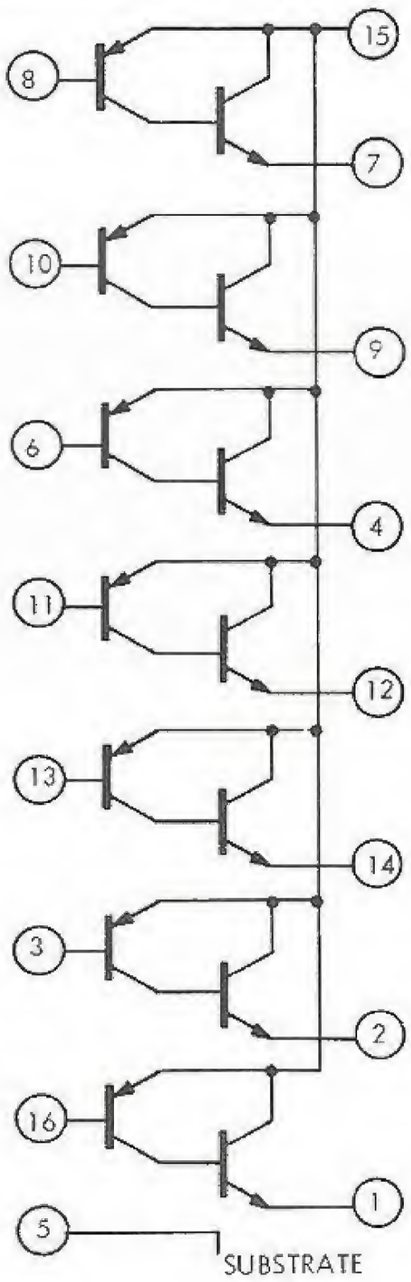
Sprague Electric now offers seven new monolithic active-device arrays which combine the performance and versatility of discrete devices with the inherent reliability and matching of integrated circuits. The power dissipation, T_A to +55 C is 300 mW for each transistor and 750 mW for the total package.

Type Number	Package	Description	Operating Temperature Range
ULN-2031A	16-Lead Plastic DIP-EA	High-Current Darlingtons-NPN-(hfe-500> <5000)	0°C to +85°C
ULN-2032A	16-Lead Plastic DIP-EA	High-Current Darlingtons-PNP-(hfe-500> <5000)	0°C to +85°C
ULN-2033A	16-Lead Plastic DIP-EA	High-Current Darlingtons-PNP-(hfe-50> <500)	0°C to +85°C
ULN-2046A	14-Lead Plastic DIP-EA	3 Isolated Transistors and 1 Differential Amplifier	0°C to +85°C
ULN-2054A	14-Lead Plastic DIP-EA	Dual Independent Differential Amplifiers	0°C to +85°C
ULN-2081A	16-Lead Plastic DIP-EA	7 Transistors with Common Emitters	0°C to +85°C
ULN-2082A	16-Lead Plastic DIP-EA	7 Transistors with Common Collectors	0°C to +85°C



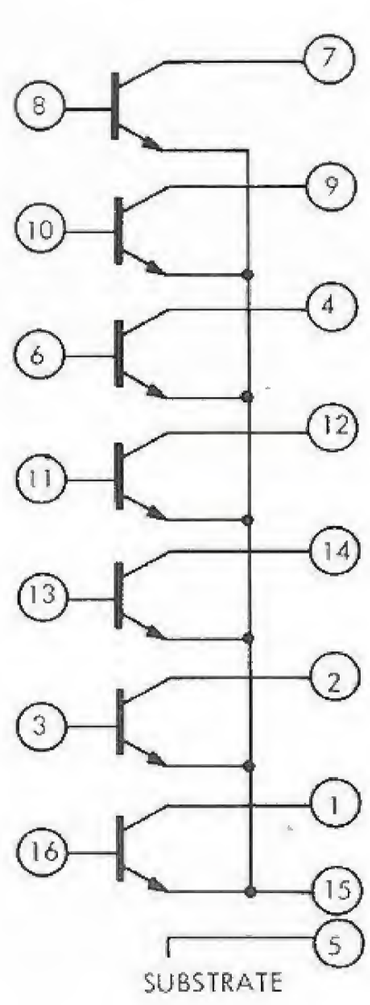
DWG. NO. A-9244

ULN-2031A



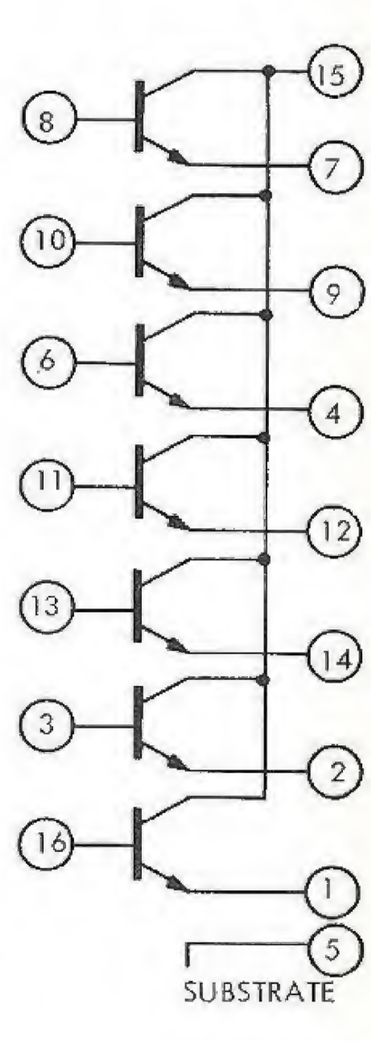
DWG. NO. A-9245

ULN-2032A
ULN-2033A



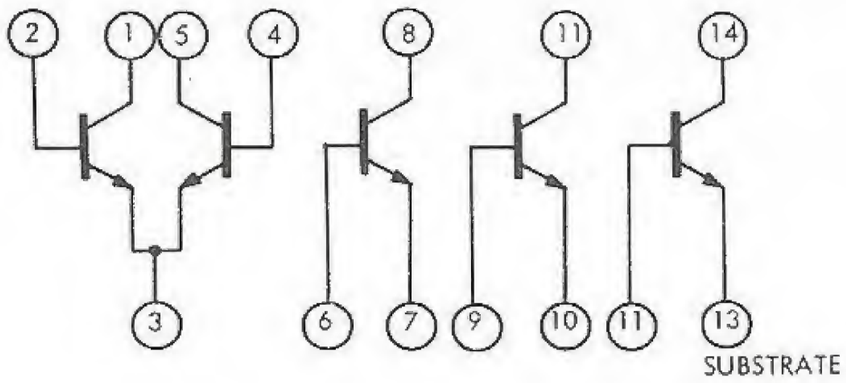
DWG. NO. A-9245A

ULN-2081A



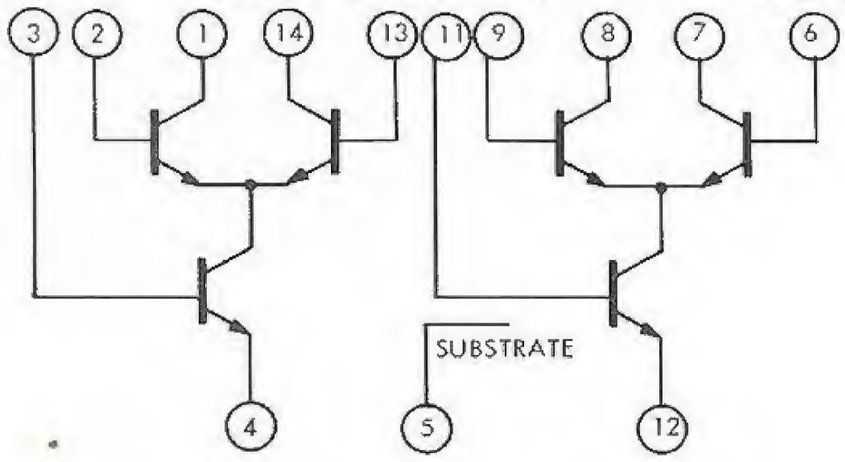
DWG. NO. A-9243A

ULN-2082A



DWG. NO. A-9234A

ULN-2046A



DWG. NO. A-9235A

ULN-2054A

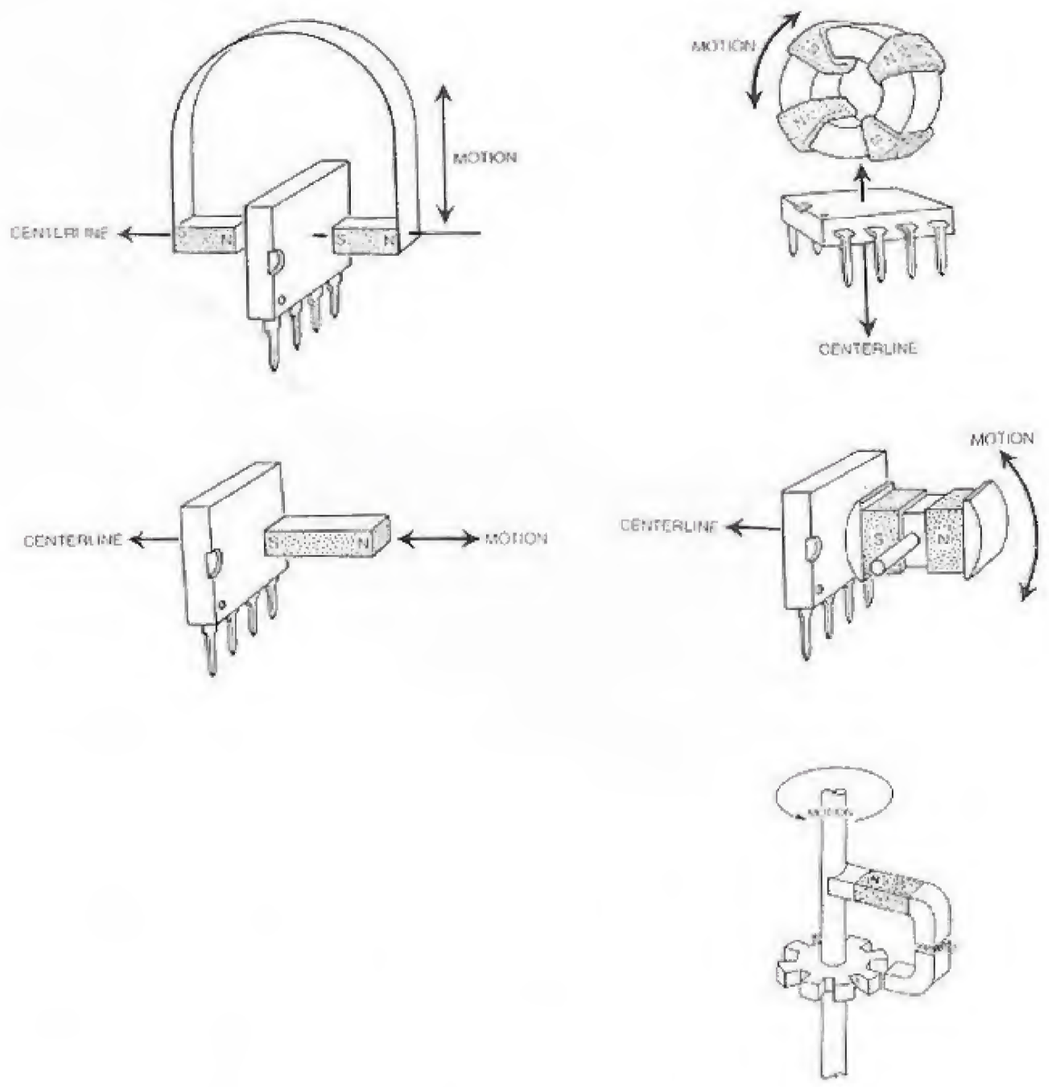
SERIES 3000
MAGNETICALLY-ACTIVATED SWITCHES

Here's a Better Way to Measure Motion . . .

To meet the designers needs for communications and data preparation systems, Sprague Electric engineers have developed a completely new revolutionary solid-state switching. This concept offers switch designers high performance switching characteristics at a cost compatible with snap-action or reed switches.

The heart of this new switch is a solid-state device containing an integrated circuit incorporating a Hall generator, trigger circuit, and signal amplification circuit on a single silicon chip.

Switching is dependent on the proximity of an external magnet whose magnetic flux passes through the Hall generator perpendicular to the chip face. As the external magnet is moved towards the Hall generator, the generator produces an analog voltage proportional to the magnetic field intensity. The Hall voltage is then converted to a digital output by the trigger circuit and is then amplified.



FEATURES

- Directly Compatible with Both TTL/DTL Logic Devices
- High Frequency Operation—up to 1 MHz
- Operates from 5 Volt Power Supply or 3 to16 Volt (ULN/ULS-3006 only)
- Operable with a Small Permanent Magnet
- High Reliability – Eliminates Contact Wear, Contact Bounce; has no moving parts
- Small Size
- 0°C to +70°C Operation
  −55°C to +125°C Operation (ULS-3006 only)

TYPE	DESCRIPTION
ULN-3000	Level Output – Open Collector
ULN-3001	Level Output – Emitter Open
ULN-3002	Magnetic Latch-Open Collector (Device senses change in magnetic field from N to S Pole: Switches on for S, off for N)
ULN-3003	Magnetic Latch – Open Emitter (same response as Type ULN-3002)
ULN-3004	Pulse Output – 40μs Pulse
*ULN-3005	Ion Implant Version of ULN-3004
ULN-3006	Level Output (has internal voltage regulator)
ULS-3006	Level Output (same as ULN-3006 except rated for operation −55°C to +125°C)
*ULN-3007	Low Power Version of ULN-3000 with Internal Voltage Regulator and 3 Outputs
*ULN-3008	Linear Output with Internal Voltage Regulator.
ULN-3100	CALIBRATED HALL ELEMENT (used as an empirical design aid or as a production calibration or test vechicle)

*In development

NOTES:

1. These devices are available in two package configurations: the dual in-line "M" package and the 4-lead single ended "ES" package. The Package is designated by a suffix letter: i.e. ULN-3001S, etc.

OPERATIONAL AMPLIFIERS

DEVICE DESCRIPTION	DUAL-IN-LINE PACKAGE				METAL CAN	
	"EA" PACKAGE	"EH" PACKAGE		"EM" PACKAGE	"BD" AND "BK" PACKAGE	
	−55 to +100°C	−55 to +100°C	−55 to +125°C	−55 to +100°C	−55 to +100°C	−55 to +125°C
High Slew Rate				ULN-2139M	ULN-2139D	ULS-2139D
Freq. Comp. Gen. Purpose				ULN-2151M	ULN-2151D	ULS-2151D
High Slew Rate Low Input Bias				ULN-2156M*	ULN-2156D*	ULS-2156D
Dual Freq. Comp. Gen. Purpose	ULN-2157A	ULN-2157H	ULS-2157H		ULN-2157K	ULS-2157K
Uncomp. Gen Purpose 2151				ULN-2158M	ULN-2158D	ULS-2158D
Low Input Bias High Slew Rate				ULN-2171M	ULN-2171D	ULS-2171D
Uncompensated 2171				ULN-2172M	ULN-2172D	ULS-2172D
High Input Impedance				ULN-2173M	ULN-2173D	ULS-2173D
Uncompensated 2173				ULN-2174M	ULN-2174D	ULS-2174D
High Slew Rate				ULN-2175M	ULN-2175D	ULS-2175D
Uncompensated 2175				ULN-2176M	ULN-2176D	ULS-2176D
Very Low Input Bias				ULN-2177M	ULN-2177D	ULS-2177D
Uncompensated 2177				ULN-2178M	ULN-2178D	ULS-2178D

*Temp. Range −25 to +100°C

SELECTION GUIDE FOR MILITARY APPLICATIONS

ULS Key Features	2139 High Slew Rate	2151 Good Input Bias	2156 High Slew Rate	2157 Dual 2151	2158 Un-Comp 2151	2171 High Slew Rate	2172 Un-Comp 2171	2173 Low Input Bias	2174 Un-Comp 2173	2175 High Input Imp	2176 Un-Comp 2175	2177 Very Low Input Bias	2178 Un-Comp 2177
Input Offset Voltage (mV max.)	3.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
Input Offset Current (nA max.)	60	5.0	2.0	5.0	5.0	7.0	7.0	7.0	1.5	1.5	1.5	0.3	0.3
Input Bias Current (nA Max.)	500	50	15	50	50	15	15	3	3	3	3	0.6	0.6
Input Resistance (MΩ Typ.)	0.3	3.0	3.0	3.0	3.0	10	10	20	20	20	20	30	30
Max. Offset Voltage Over T (mV)	4.5	5	6	5	3.5	5	3.5	5	3.5	3.5	3.5	3.5	3.5
Max. Offset Current Over T (nA)	80	15	5	15	10	17	17	7	7	3.5	3.5	1.5	1.5
Voltage Gain (KV/V Min.)	50	50	100	50	50	50	50	100	100	50	50	100	100
Power Dissipation (mW Max.)	150	85	45	85	85	90	90	35	35	85	85	35	35
Slew Rate (V/μs Typ.)	4.2	0.6	2.5	0.6	0.6	1.5	1.5	0.3	0.3	1.5	1.5	0.3	0.3
Max. Supply Voltage	±18	±22	±22	±22	±22	±22	±22	±22	±22	±22	±22	±22	±22
Frequency Compensation Requirements	390Ω 2200pF	None	None	None	30pF	None	33pF	None	15pF	None	33pF	None	15pF

SELECTION GUIDE FOR COMMERCIAL APPLICATIONS

ULN Key Features	2139 High Slew Rate	2151 Good Input Bias	2156 High Slew Rate	2157 Dual 2151	2158 Un-Comp 2151	2171 High Slew Rate	2172 Un-Comp 2171	2173 Low Input Bias	2174 Un-Comp 2173	2175 High Input Imp	2176 Un-Comp 2175	2177 Very Low Input Bias	2178 Un-Comp 2177
Input Offset Voltage (mV Max.)	7.5	5	10	5	5	5	5	5	5	5	5	5	5
Input Offset Current (nA Max.)	100	50	10	50	50	20	20	5	5	5	5	1	1
Input Bias Current (nA Max.)	1000	250	30	250	250	50	50	10	10	10	10	2	2
Input Resistance (MΩ Typ.)	0.15	1.5	3.0	1.5	1.5	5	5	10	10	10	10	30	30
Max. Offset Voltage Over T (mV)	9	6.5	14	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Max. Offset Current Over T (nA)	115	50	14	50	50	30	30	15	15	6.0	6.0	3.0	3.0
Voltage Gain (KV/V Min.)	15	25	70	25	25	25	25	50	50	25	25	50	50
Power Dissipation (mW Max.)	200	85	90	85	85	90	90	45	45	90	90	45	45
Slew Rate (V/μs Typ.)	4.2	0.6	2.5	0.6	0.6	1.5	1.5	0.3	0.3	1.5	1.5	0.3	0.3
Max. Supply Voltage	±18	±20	±18	±20	±20	±20	±20	±20	±20	±20	±20	±20	±20
Frequency Compensation Requirements	390Ω 2200pF	None	None	None	30pF	None	33pF	None	15pF	None	33pF	None	15pF

All Operational Amplifiers are:
1. Output short circuit protected.
2. Input protected.
3. Capable of offset voltage adjustment.

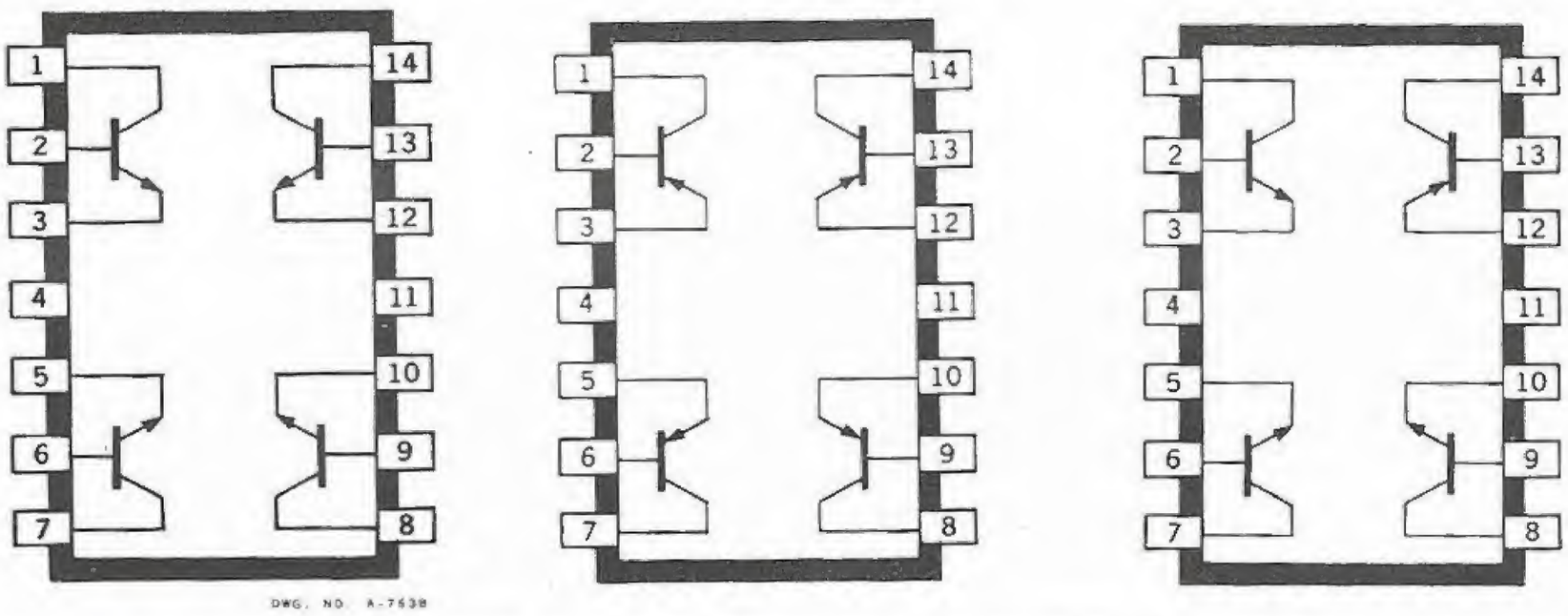
QUAD TRANSISTORS

	UHC Flat-Pack(AM)	UHP Plastic DIP(EA)	UHD Ceramic DIP(EH)
Operating Temperature Range	−55 C to +125 C	0 C to +70 C	−55 C to +125 C
Total Dissipation at T_A = 25 C	500mW	960 mW 1.5W (Package Option A) 2.0W (Package Option B)	1.5W

SELECTION GUIDE

Device Number*	Function	Similar To	V_{CBO} (Volts)	V_{CFO} (Volts)	V_{EBO} (Volts)	V_{ECO} (Volts)	h_{FE} 100mA	h_{FE} 10mA	h_{FE} 500mA	V_{SAT} @ 500mA (Volts)	V_{OFF} @1mA (mV)	T_{ON} (ns)	T_{OFF} (ns)
4219	NPN General Purpose	2N2219	60	40	5	—	35	—	—	—	—		
4369	NPN High Speed Switch	2N2369	40	15	4.5	—	—	30	—	—	—	12	18
4432	NPN Chopper	2N2432	25	20	—	15	—	—	—	—	1		
4725†	NPN Core Driver	2N3725	50	30	5	—	—	—	20	0.5	—		
4907	PNP General Purpose	2N2907	60	40	5	—	35	—	—	—	—		
4945	PNP Chopper	2N2945	25	20	—	15	—	—	—	—	1		
5026	NPN/PNP General Purpose	2N2219 2N2907	60	40	5	—	35	—	—	—	—		
5077	NPN/PNP Chopper	2N2432 2N2945	25	20	—	15	—	—	—	—	1		

*Prefix device number with letters UHC for flat-pack, UHP for plastic dual in-line, or UHD for ceramic dual in-line package.
†Type UHP-4725 was formerly UHP-004, UHP-4725A was UHP-017, and UHP-4725B was UHP-021.



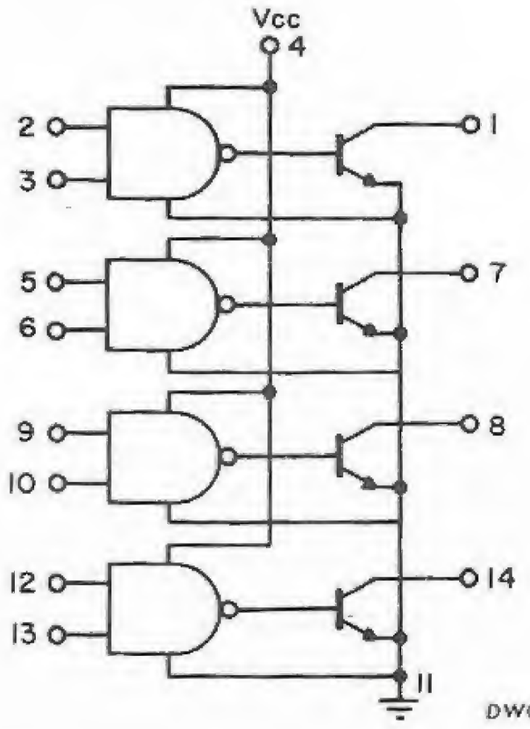
DWG. NO. A-7638

QUAD POWER DRIVERS

UHC-181
(formerly UHC-131)
UHP-181
UHD-181

FEATURES

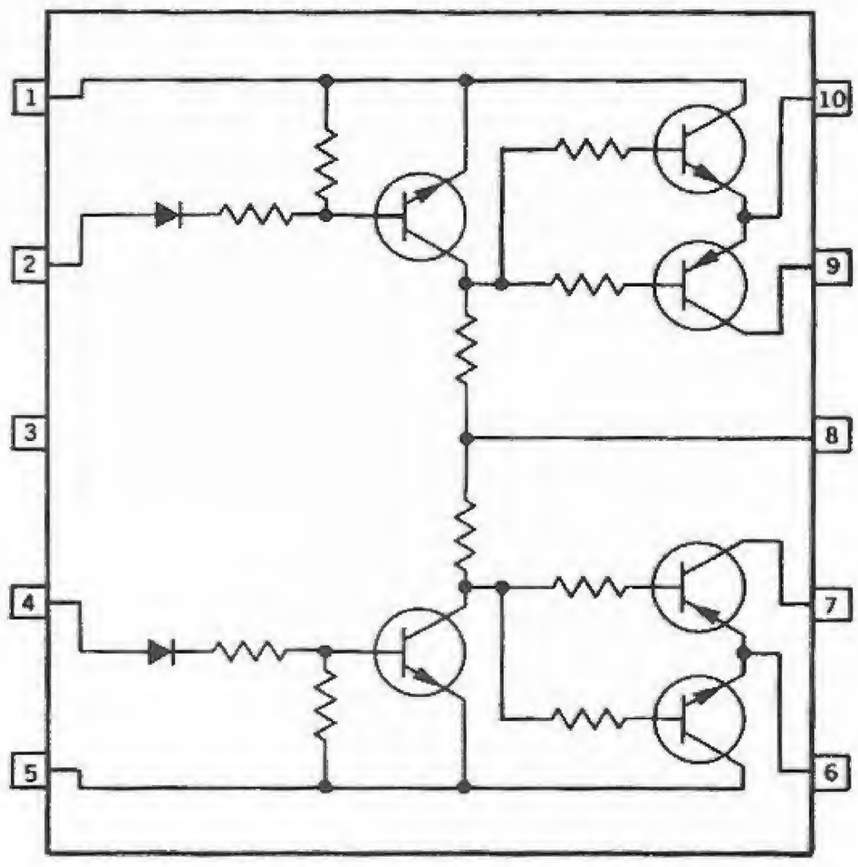
- High Output Voltage: 40 Volts
- High Output Sink Current: 250mA/Driver
- Reduced Size: 4 Drivers/Package
- Inputs Compatible with DTL and TTL Logic
- Operating Temperature Range:
  UHC-181, UHD-181 . . . . . −55 C to +125 C
  UHP-181 . . . . . 0 C to +70 C
- Package
  UHC-181 . . . . . Flat-Pack AM
  UHD-181 . . . . . Plastic Dual In-Line EA
  UHP-181 . . . . . Ceramic Dual In-Line EH



DWG. NO. A-7026

POSITIVE DUAL BUFFER SWITCH

UHC-074
UHC-080



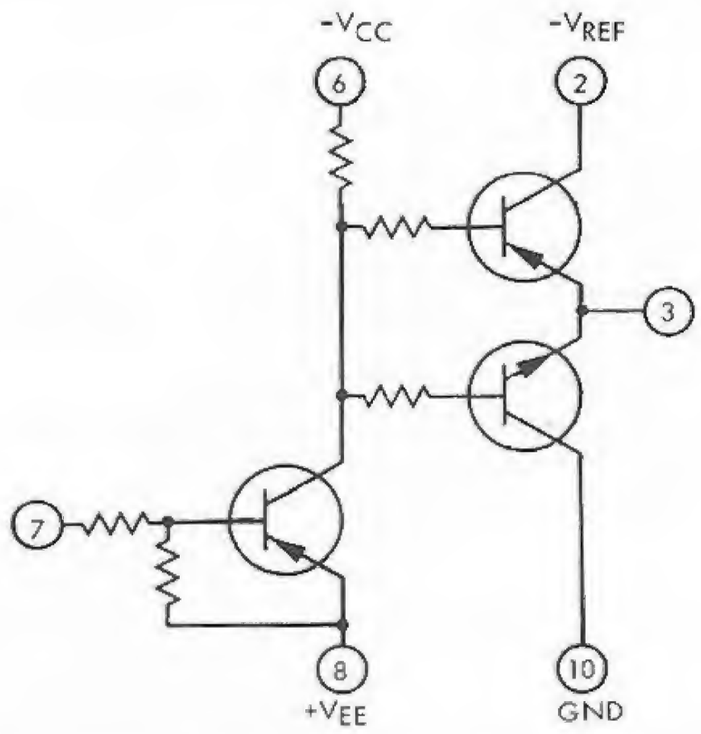
DWG. NO. A-6206

FEATURES

- High Voltage Rating:
  - UHC-074 . . . . . 20 Volts
  - UHC-080 . . . . . 30 Volts
- Inputs Compatible with DTL and TTL Logic
- Flat Pack – AH (TO-87)
- Low Offset Voltage: 1 mV
- Low Series Resistance: 10Ω
- Operating Temperature Range: −55 C to +125 C

NEGATIVE BUFFER SWITCH

UHC-178
UHC-179



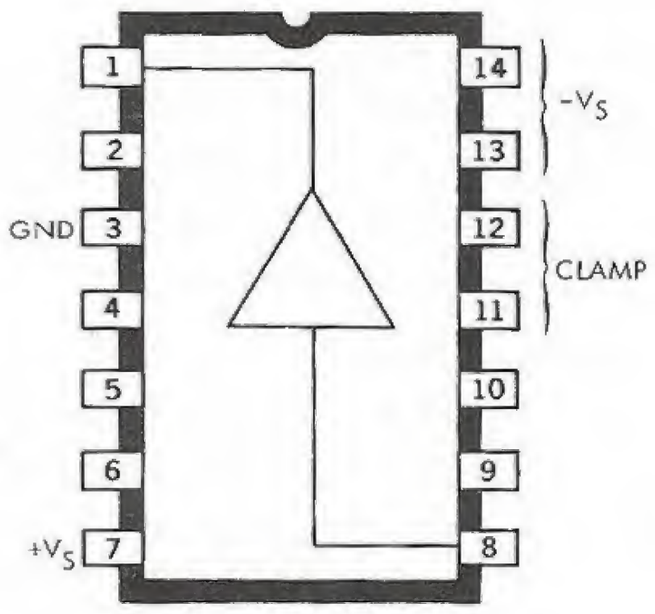
FEATURES

- Inputs Compatible with DTL and TTL Logic
- Low Offset Voltage:
  - UHC-178 . . . . . 1mV
  - UHC-179 . . . . . 2mV
- Low Series Resistance:
  - UHC-178 . . . . . 20Ω
  - UHC-179 . . . . . 30Ω
- Operating Temperature Range:
  - -55 C to +125 C
- Flat-Pack Package AN (TO-90)

HYBRID MOS CLOCK DRIVER

UHP-111

The Type UHP-111 high-speed universal MOS clock driver is capable of operation from d-c to 10 MHz.



FEATURES

- Output Voltage Clamp to -0.6V from a Reference Voltage
- ±1 Ampere Output Current Capability
- t_r and t_f = 18 ns Typ. into a 500 pF Load
- DTL and TTL Compatible
- Operating Temperature Range:
  - −25 C to +75 C
- Plastic Package (14 pin) Dual In-Line EA

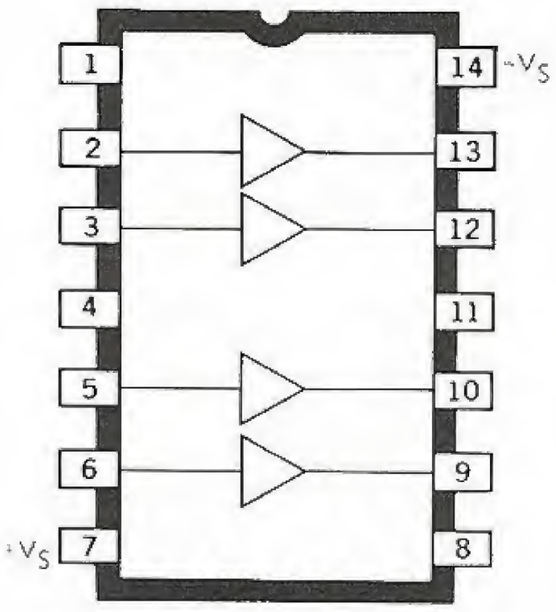
QUAD CLOCK DRIVER EXTENDER

UHP-011

The Type UHP-011 Quad Clock Driver Extender is designed for large MOS systems. Each section consists of a complementary follower capable of ±1 Ampere output drive.

The Type UHP-011, in conjunction with the Type UHP-111, results in a low-cost clock system without sacrificing speed or drive capability.

This device is housed in a 14-pin dual in-line plastic 'EA' package.

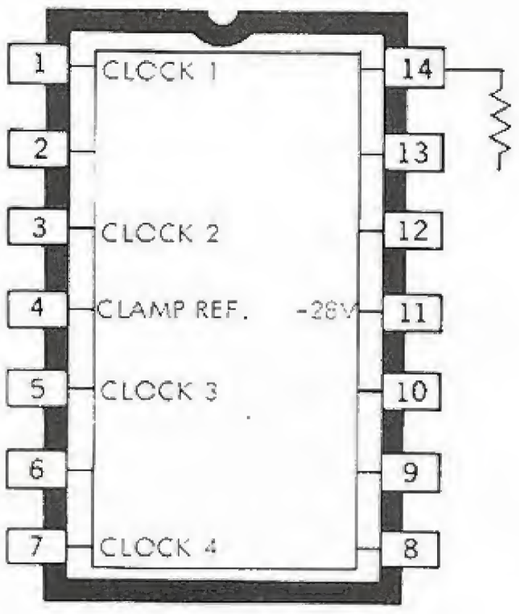


HYBRID QUAD CLAMP

UHP-031

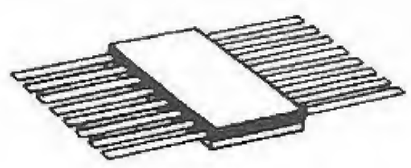
The Type UHP-031 High-Speed Quad Clamp is intended for use with MOS arrays. It is used to prevent voltage transients (due to capacitive cross talk) on MOS clock lines from going more positive than zero volts. The Type UHP-111 Clock Driver is recommended for use with this device.

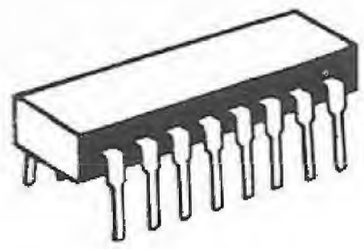
The Type UHP-031 is housed in a 14-pin dual in-line plastic 'EA' package.

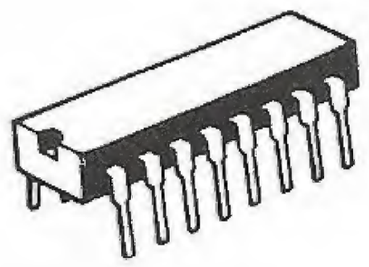


5-BIT ANALOG SWITCHES

UHC-047
UHD-047
UHP-047







The UHC-047, UHD-047, and UHP-047 are monolithic 5-Bit Analog Switches intended for use in digital-to-analog converter ladder switch, analog switch for multiplexing, sample and hold, and chopper applications.

FEATURES:

- Offset Voltage: ±2mV to ±4mV.
- Saturation Resistance: 20 to 40Ω.
- Ton/Toff Delay Time: 1 μs.
- Inputs DTL/TTL Compatible.

PACKAGE:

- UHC-047 AP Flat-pack
- UHD-047 ED Ceramic DIP
- UHP-047 EA Plastic DIP

OPERATING TEMPERATURE RANGE:

- UHC-047, UHD-047 −55°C to +125°C
- UHP-047 0°C to +70°C

QUAD CURRENT SWITCHES

UHC-054
UHD-054
UHP-054

The Type UHC-054, UHD-054, and UHP-054 monolithic integrated circuits consist of four logic-operated current switches designed specifically for precision current-summing digital-to-analog converter applications. Each switch has a reference transistor to minimize scale-factor drift in D/A applications.

FEATURES

	UH_-054J	UH_-054K	UH_-054L
● Non Linearity	±1%	±0.1%	±0.01%
● TC of Linearity	±10ppm/°C	±5ppm/°C	±1ppm/°C

- 3V to 10V Variable Reference
- 200 ns Switching and Settling Time
- ±15V Power Supply Voltage
- TTL Compatible Inputs
- Package
  - UHC-054 14-pin Flat-Pack
  - UHD-054 14-pin Ceramic Dual In-Line
  - UHP-054 14-pin Plastic Dual In-Line

SERIES 400 and 500 POWER DRIVERS

- Inputs Compatible with DTL/TTL
- 250mA Output Current Capabilty/Driver
- Pinning Compatible with Series 54/74 Networks
- Transient Protected Outputs – Types 403, 406, 407, 433, 503, 506, 507 and 533
- High Voltage Output Capability/Driver – 100V Series 500, 40V Series 400

Designed for lamp driver, relay driver, level shifter, and similar applications, Series 400 and 500 comprise a compatible set of power drivers are monolithic ICs with logic gates driving high-current switching transistors.

Operating at a standard V_{CC} voltage of 5 volts, each Series 400 or 500 Driver output transistor is capable of sinking 250mA in the ON state. In the OFF state, Series 400 device outputs will sustain 40 volts and Series 500 device outputs will sustain 100 volts.

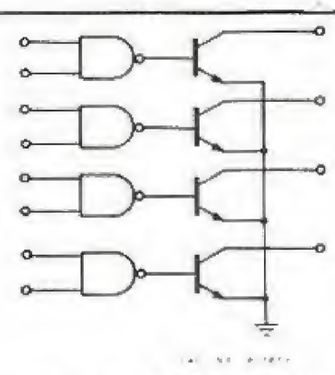
Series UHC-400, UHD-400, UHC-500 and UHD-500 are specified for operation over the full military temperature range of −55°C to +125°C while Series UHP-400 and UHP-500 are rated for 0°C to +70°C ambients.

The Series 400 and 500 Power Drivers are available in three package outlines:

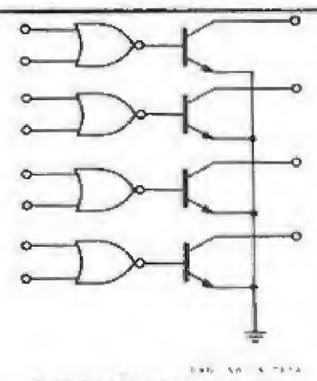
Package	Description	Available as
AJ	14-Lead Flat-Packs	Series UHC-400 and UHC-500
ED	14-Lead Hermetic DIP	Series UHD-400 and UHD-500
EA	14-Lead Plastic DIP	Series UHP-400 and UHP-500

LOGIC DIAGRAMS

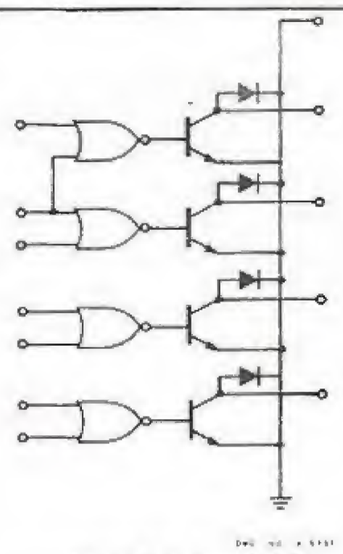
40V SERIES 400
100V SERIES 500



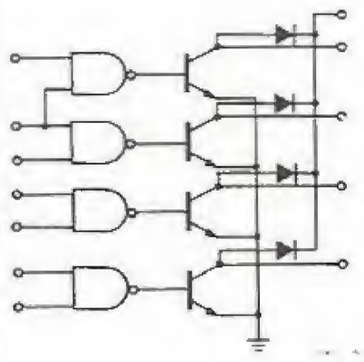
400/500 QUAD 2 AND



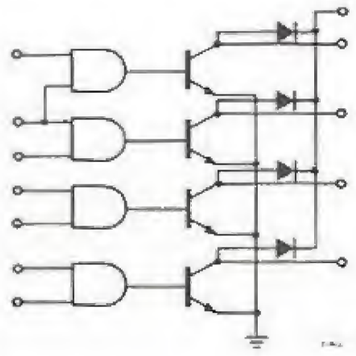
402/502 Quad 2 OR



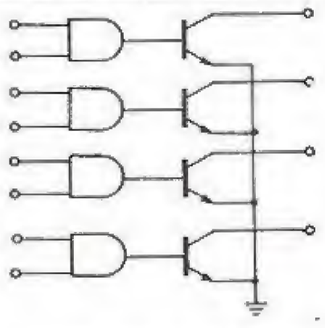
403/503 Quad OR



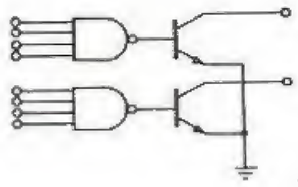
406/506 Quad AND



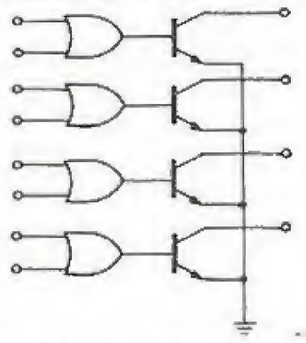
407/507 Quad NAND



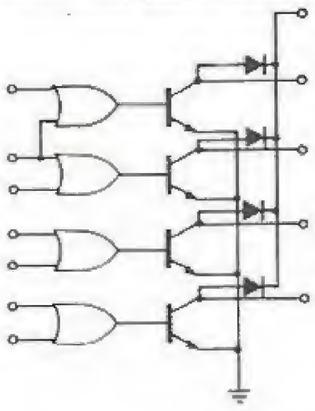
408/508 Quad 2 NAND



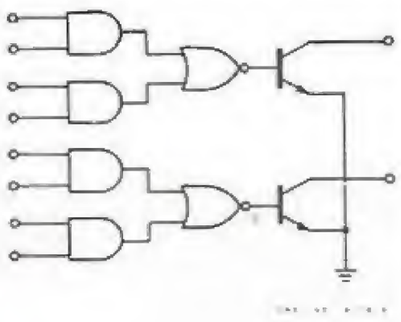
420/520 Dual 4 AND



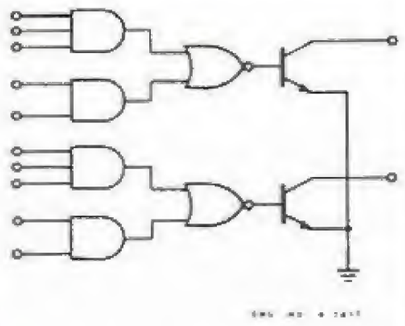
432/532 Quad 2 NOR



433/533 Quad NOR



451/551 Dual 2 AND-OR



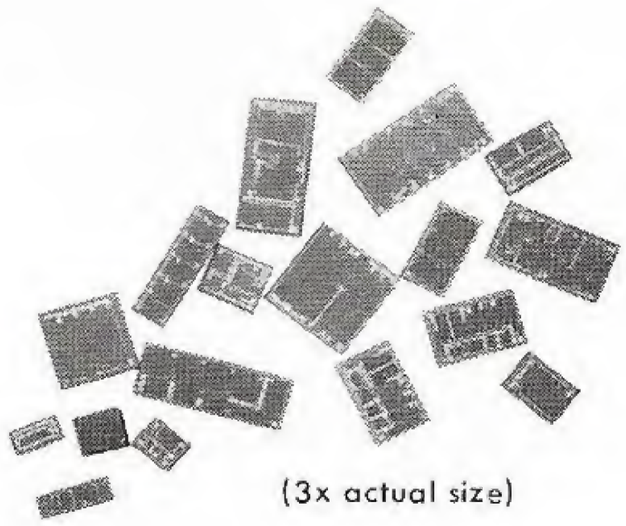
459/559 Dual 2-3 AND-OR

MULTI-TERMINAL UNENCAPSULATED THIN-FILM RESISTOR ARRAYS

Unencapsulated Multi-Terminal Thin-Film Resistors have been specifically designed for use in hybrid circuits. Their electrical characteristics, reliability, and stability are unsurpassed in the passive component industry

These resistor chips are 1 to 1 assembly compatible with IC's, transistors, diodes, and other silicon devices. Their etched silicon backing allows easy, reliable die bonding using eutectic, epoxy or other conventional die-attach techniques.

Large surface aluminum wire bond pads are strategically located to allow multiple wire bonds and minimum die orientation. These resistor chips are available in ±10% and 20% tolerances. Tighter tolerances, specific temperature coefficient of resistances, as well as complex arrays, are available.



(3x actual size)

Resistors are available in chips and wafers. Sprague offers two standard packaging methods for the chips Multi-Chip Trays and Tube-Paks.

- **Choice of Nickel Chromium or Tantalum Nitride**
- **Very low noise**
- **Discrete Resistors or Networks**

	NiCr	TaN
Resistivity Range	125 to 250Ω/□	100 to 300Ω/□
Resistance Range	15Ω to 950KΩ	15Ω to 800KΩ
TC of Resistance	0 to +50 PPM/°C	−50 to −200 PPM/°C
Resistor Tracking Coefficient	±1 PPM/°C	±1 PPM/°C
Stability—1,000 hrs. life	<.25% (125°C)	<.25% (85°C)
Noise (Max)	0.01 μv/V Max. per MIL-STD-202D, Method 308	0.1 μv/V Max. per MIL-STD-202D, Method 308

DIGITAL-TO-ANALOG CONVERTER NETWORKS

MIL-LINE D/A Converters

Each device is a complete converter consisting of ladder network circuitry, monolithic switches, buffers, and an output amplifier (when applicable), all encapsulated in a Moduline plastic package. Each of the proprietary monolithic devices and the thin-film resistor ladder networks used are constructed to meet or exceed the requirements of military specification MIL-STD-883.

The excellent accuracy exhibited by this series is arrived at through Sprague's laser adjustment of the thin-film nickel-chromium resistor ladder networks.

Other Features Are:

- Inputs all on one side, outputs and supply voltages on the other.
- Excellent temperature coefficient: to <1ppm/°C.
- Fast conversion time: to 2 μs.
- Broad operating temperature range: −55°C to +125°C.
- Choice of output amplifiers.
- Standard power supply requirements: +15V and −15V (some types).
- Accuracy ±½LSB over 0°C to +70°C ambients or ±1 LSB over −55°C to +125°C ambients.
- CMOS/TTL/DTL input compatible D/A's, negative or positive logic, available all in one D/A.
- BCD or binary input codes available (off-set code) up to 12 binary bits or 3 digit (higher bit accuracies on special request).
- Variations of standard D/A's upon special request.

MODULINE® D/A Converters

Each converter consists of buffer amplifier ladder switches, and ladder network circuitry mounted on a single wiring board and packaged in modified non-hermetic dual in-line cases. The series is designed for low cost Industrial/Commercial applications over 0 C to +70 C ambients.

Other Features Are:

- ±½LSB accuracy.
- Digital word length to 12 bits.
- 25 KΩ output impedance.
- 5ppm/°C maximum temperature coefficient.
- Conversion speeds to 4.8μs.
- Package with 100 mil grid spacing on the pins.

SUB-ASSEMBLIES

This series consists of individually packaged buffer amplifiers, ladder switches, and ladder network circuitry and is intended for use where ±½ LSB accuracy over the full military temperature range of −55°C to +125°C is a prime design consideration. By interconnecting the various devices D/A converters with resolutions from 4 bits to 12 bits can be constructed. All the networks are housed in hermetic sealed flat-pack packages and are constructed to meet or exceed the requirements of Military Specification MIL-STD-883.

TYPE	NUMBER PACKAGES REQUIRED	INPUT RESOLUTION (DT/TTL COMPATIBLE)	ACCURACY	OUTPUTS ADJUSTABLE TO (mV)
MIL-LINE D/A CONVERTERS IN HERMETIC SEALED PACKAGES				
UHM-308	1	2 Digit BCD (8 Bits)	±½LSB (1)	19.53
UHM-308A	1	2 Digit BCD (8 Bits)	±½LSB (1)	19.53
UHM-309	1	2 Digit BCD (8 Bits)	±½LSB (1)	19.53
UHM-309A	1	2 Digit BCD (8 Bits)	±½LSB (1)	19.53
UHM-312	1	3 Digit BCD (12 Bits)	±½LSB (1)	1.22
UHM-312A	1	3 Digit BCD (12 Bits)	±½LSB (1)	1.22
UHM-313	1	3 Digit BCD (12 Bits)	±½LSB	1.22
UHM-313A	1	3 Digit BCD (12 Bits)	±½LSB	1.22
UHM-332(4)	1	(8) 3 Digit BCD (12 Bits)	±½LSB (1)	2.44
UHM-333(4)	1	(8) 3 Digit BCD (12 Bits)	±½LSB (1)	2.44
UHM-400	1	4 Binary Bits	±½LSB	78
UHM-400 UHM-410	1	8 Binary Bits	±½LSB	39
UHM-400 UHM-410A UHM-410B	1	12 Binary Bits	±½LSB	1.22
UHM-408(5)	1	(8) 8 Binary Bits	±½LSB (1)	19.53
UHM-409(5)	1	(8) 10 Binary Bits	±½LSB (1)	4.88
UHM-412(5)	1	(8) 12 Binary Bits	±½LSB (1)	2.44
UHM-503	1	10 Binary Bits	±½LSB (1)	4.88
UHM-503A	1	10 Binary Bits	±½LSB (1)	4.88
UHM-506	1	10 Binary Bits	±½LSB (1)	4.88
UHM-506A	1	10 Binary Bits	±½LSB (1)	4.88
UHM-523	1	8 Binary Bits	±½LSB (1)	19.53
UHM-523A	1	8 Binary Bits	±½LSB (1)	19.53
UHM-526	1	8 Binary Bits	±½LSB (1)	19.53
UHM-526A	1	8 Binary Bits	±½LSB (1)	19.53
MODULINE D/A CONVERTERS IN NON-HERMETIC SEALED PACKAG				
UHM-500	1	10 Binary Bits	±½LSB	4.88
UHM-504	1	4 Binary Bits	±½LSB	78
UHM-505	1	5 Binary Bits	±½LSB	156.2
UHM-504 UHM-508	1 1	8 Binary Bits	±½LSB	39
UHM-504 UHM-508A UHM-508B	1 1 1	12 Binary Bits	±½LSB	2.44
SUB-ASSEMBLIES IN HERMETIC SEALED FLAT-PACK PACKAGES				
UHC-024 UHC-001 UHR-010	1 1 1	4 Binary Bits	±½LSB	78
UHC-037 UHC-036 UHR-001	1 1 1	5 Binary Bits	±½LSB	156.25
UHC-024 UHC-001 UHR-010	2 2 2	8 Binary Bits	±½LSB	19.53
UHC-037 UHC-036 UHR-001 UHR-001A	2 2 1 1	10 Binary Bits	±½LSB	4.88
UHC-024 UHC-001 UHR-010	3 3 3	12 Binary Bits	±½LSB	2.44

NOTES:

1. −25°C to +85°C is recommended to maintain ±½LSB accuracy; −55°C to +125°C ambients may derate accuracy to ±1LSB.
2. This is the conversion time utilizing the internal Op amp.
3. Gain of 2 (50K feedback resistor).
4. Input code = offset BCD.

THIN-FILM HYBRID CIRCUITS (continued)

TEMPERATURE COEFFICIENT (ppm/°C)	REFERENCE VOLTAGE (EXTERNAL)	OUTPUT	CON-VERSION TIME (μsec)	POWER SUPPLY REQUIREMENTS	OPERATING TEMPERATURE RANGE	INTERNAL OP. AMP. INCLUDED	CASE OUTLINE
<3	−10VDC	−10VDC	2	+4V, −20V, V_{ref}	−55°C to +125°C(1)	No	MB
<3	−10VDC	−10VDC	2	+15V, −15V, V_{ref}	−55°C to +125°C(1)	No	MB
<3	−10VDC	(7) ±10VDC	20	+4V, −20V, V_{ref}, ±15V	−55°C to +125°C(1)	Yes	MB
<3	−10VDC	(7) ±10VDC	20	+15V, −15V, V_{ref}	−55°C to +125°C(1)	Yes	MB
<3	−10VDC	−10VDC	15	+4V, −20V, V_{ref}	−55°C to +125°C(1)	No	MB
<3	−10VDC	−10VDC	15	+15V, −15V, V_{ref}	−55°C to +125°C(1)	No	MB
<3	−10VDC	(7) ±10VDC	15	−4V, −20V, V_{ref}, ±15V	−55°C to +125°C(1)	Yes	MB
<3	−10VDC	(7) ±10VDC	15	+15V, −15V, V_{ref}	−55°C to +125°C(1)	Yes	MB
<1(9)	±10V (Bipolar)	(6) ±10V/20V P-P	20	+15V, −15V, V_{ref}	−55°C to +125°C(1)	No	MB
<3	±10V (Bipolar)	(6) ±10V°20V P-P	20	+15V, −15V, V_{ref}	−55°C to +125°C(1)	Yes(3)	MB
<5	−10VDC	−10VDC	4.8	+4V, −20V, V_{ref}	0°C to +70°C	No	MB
<5	−10VDC	−10VDC	4.8	+4V, −20V, V_{ref}	0°C to +70°C	No	MB MB
<5	−10VDC	−10VDC	4.8	+4V, −20V, V_{ref}	0°C to +70°C	No	MB MB MB
<3	±10V (Bipolar)	(6) ±10Vdc/20V P-P	20	+15V, −15V, V_{ref}	−55°C to +125°C(1)	Yes	ME
<3	±10V (Bipolar)	(6) ±10Vdc/20V P-P	20	+15V, −15V, V_{ref}	−55°C to +125°C(1)	Yes	ME
<3	±10V (Bipolar)	(6) ±10Vdc/20V P-P	20	+15V, −15V, V_{ref}	−55°C to +125°C(1)	Yes 3	ME
<3	−10VDC	−10VDC	2.5	+4V, −20V, V_{ref}	−55°C to +125°C(1)	No	ME
<1	−10VDC	−10VDC	2	+15V, −15V, V_{ref}	−55°C to +125°C(1)	No	ME
<3	−10VDC	±10VDC	2	+4V, −20V, −15V, +15V, V_{ret}	−55°C to +125°C(1)	Yes	ME
<2	−10VDC	±10VDC	2	+15V, −15V, V_{ref}	−55°C to +125°C(1)	Yes	ME
<3	−10VDC	−10VDC	2	+4V, −20V, V_{ref}	−55°C to +125°C(1)	No	ME
<1	−10VDC	−10VDC	2	+15V, −15V, V_{ref}	−55°C to +125°C(1)	No	ME
<3	−10VDC	±10VDC	2	+4V, −20V, ±15V, V_{ref}	−55°C to +125°C(1)	Yes	ME
<3	−10VDC	±10VDC	2	+15V, −15V, V_{ref}	−55°C to +125°C(1)	Yes	ME
<5	−10VDC	−10VDC	4.8	−4V, −20V, V_{ref}	0°C to +70°C	No	MA
<5	−10VDC	−10VDC	10	+4V, −20V, V_{ref}	0°C to +70°C	No	MB
<5	−10VDC	−10VDC	4.8	+4V, −20V, V_{ref}	0°C to +70°C	No	MF
<5	−10VDC	−10VDC	10	+4V, −20V, V_{ref}	0°C to +70°C	No	MB MB
<5	−10VDC	−10VDC	10	+4V, −20V, V_{ref}	0°C to +70°C	No	MB MB MB
<5	−10VDC	−10VDC	10	+4V, −20V, V_{ref}	−55°C to +125°C	No	AH AG AM
<5	−10VDC	−10VDC	4.2	+4V, −20V, V_{ref}	−55°C to +125°C	No	AI AI AF
<5	−10VDC	−10VDC	10	+4V, −20V, V_{ref}	−55°C to +125°C	No	AH AG AF
<5	−10VDC	−10VDC	4.2	+4V, −20V, V_{ref}	−55°C to +125°C	No	AI AI AF AF
<5	−10VDC	−10VDC	10	+4V, −20V, V_{ref}	−55°C to +125°C	No	AH AG AM

5. Input code = offset binary.
6. Output Voltages of ±18V may be obtained by operating ±Vcc at $20V_{DC}$.
7. +OR $-10V_{DC}$ outputs are possible depending on how op amp is connected.
8. CMOS (neg logic) input compatible.
9. At ±½LSB linearity.

COMPLEX-FUNCTION CIRCUITS IN SINGLE PACKAGES

Reduce COSTS
Reduce PACKAGE COUNT
Reduce INTERCONNECTIONS

TTL logic, in conjunction with multiple function design, fully exploits the inherent capabilities of integrated semiconductor structures. The use of additional transistors and multiple-emitter structures provides performance parameters that are virtually independent of temperature and loading.

- Diode clamping on all inputs prevents "line ringing" problems
- High speed, low power dissipation
- High noise margin, high fan-out
- Excellent capacitance driving capability
- Compatible with Series 54 / 74 devices.

DEVICE DESCRIPTION	Pins per Pkg.	DUAL IN-LINE PACKAGE "A" PACKAGE 0 to +70°C	DUAL IN-LINE PACKAGE "A" PACKAGE −55 to +125°C	DUAL IN-LINE PACKAGE "H" PACKAGE 0 to +70°C	DUAL IN-LINE PACKAGE "H" PACKAGE −55 to +125°C	FLAT-PACK PACKAGE "J" PACKAGE −55 to +125°C	FLAT-PACK PACKAGE "G" PACKAGE −55 to +125°C
DECODERS:							
BCD-to-Decimal Decoder/Driver	16	US7441A	US5441A	US7441H	US5441H	US5441J	US5441G
BCD-to-Decimal Decoder	16	US7442A	US5442A	US7442H	US5442H	US5442J	US5442G
Excess-3-to-Decimal Decoder	16	US7443A	US5443A	US7443H	US5443H	US5443J	US5443G
Excess-3-Gray-to-Decimal Decoder	16	US7444A	US5444A	US7444H	US5444H	US5444J	US5444G
BCD-to-Decimal Decoder/Driver	16	US7445A	US5445A	US7445H	US5445H	US5445J	US5445G
BCD-to-Seven Segment Decoder Driver	16	US7446A	US5446A	US7446H	US5446H	US5446J	US5446G
BCD-to-Seven Segment Decoder Driver	16	US7447A	US5447A	US7447H	US5447H	US5447J	US5447G
BCD-to-Seven Segment Decoder Driver	16	US7448A	US5448A	US7448H	US5448H	US5448J	US5448G
BCD-to-Decimal Decoder Driver	16	US74145A	US54145A	US74145H	US54145H	US54145J	US54145G
COUNTERS:							
Decade Counter	14	US7490A	US5490A	US7490H	US5490H	US5490J	US5490G
Divide-by-Twelve Counter	14	US7492A	US5492A	US7492H	US5492H	US5492J	US5492G
4-Bit Binary Counter	14	US7493A	US5493A	US7493H	US5493H	US5493J	US5493G
Up/Down Decade Counter	16	US74192A	US54192A	US74192H	US54192H	US54192J	US54192G
Up/Down 4-Bit Binary Counter	16	US74193A	US54193A	US74193H	US54193H	US54193J	US54193G
BCD-Decade Counter/Storage Element	14	USN8280A	USS8280A	USN8280H	USS8280H	USS8280J	USS8280G
4-Bit Binary Counter/Storage Element	14	USN8281A	USS8281A	USN8281H	USS8281H	USS8281J	USS8281G
Presettable High Speed Decade Counter	14	USN8290A	USS8290A	USN8290H	USS8290H	USS8290J	USS8290G
Presettable High Speed 4-Bit Binary Counter	14	USN8291A	USS8291A	USN8291H	USS8291H	USS8291J	USS8291G
Modulo-n Divider	16	US8520A	US7520A	US8520H	US7520H	US7520J	US7520G
ARITHMETIC ELEMENTS:							
Gated Full Adder	14	US7480A	US5480A	US7480H	US5480H	US5480J	US5480G
2-Bit Binary Full Adder	14	US7482A	US5482A	US7482H	US5482H	US5482J	US5482G
4-Bit Binary Full Adder	16	US7483A	US5483A	US7483H	US5483H	US5483J	US5483G
Quadruple Exclusive-OR Gate	14	US7486A	US5486A	US7486H	US5486H	US5486J	US5486G
8-Bit Odd/Even Parity Generator/Checker	14	US74180A	US54180A	US74180H	US54180H	US54180J	US54180G
Arithmetic Logic Unit/Function Generator	24	US74181A	US54181A	US74181H	US54181H	US54181J	US54181G
Look-Ahead Carry Generator	16	US74182A	US54182A	US74182H	US54182H	US54182J	US54182G
4-Bit Comparator	14	US8200A	US7200A	US8200H	US7200H	US7200J	US7200G
Quadruple 2-Input Exclusive-OR Gate	14	USN8241A	USS8241A	USN8241H	USS8241H	USS8241J	USS8241G
Quadruple 2-Input Exclusive-NOR Gate	14	USN8242A	USS8242A	USN8242H	USS8242H	USS8242J	USS8242G
MEMORIES/LATCHES:							
Quadruple Bistable Latch	16	US7475A	US5475A	US7475H	US5475H	US5475J	US5475G
Quadruple Bistable Latch	14	—	—	—	—	US5477J	US5477G
DATA SELECTORS/MULTIPLEXERS							
Data Selector/Multiplexer	24	US74150A	US54150A	US74150H	US54150H	US54150J	US54150G
8-Input Data Selector/Multiplexer	16	US74151A	US54151A	US74151H	US54151H	US54151J	US54151G
Dual 4-line-to-1-line Data Selector/ Multiplexer	16	US74153A	US54153A	US74153H	US54153H	US54153J	US54153G
2-Bit 4-Input Digital Multiplexer	16	USN8233A	USS8233A	USN8233H	USS8233H	USS8233J	USS8233G
2-Bit 4-Input Digital Multiplexer	16	USN8234A	USS8234A	USN8234H	USS8234H	USS8234J	USS8234G
2-Bit 4-Input Digital Multiplexer	16	USN8235A	USS8235A	USN8235H	USS8235H	USS8235J	USS8235G
2-Bit 4-Input Digital Multiplexer	16	USN8266A	USS8266A	USN8266H	USS8266H	USS8266J	USS8266G
2-Bit 4-Input Digital Multiplexer	16	USN8267A	USS8267A	USN8267H	USS8267H	USS8267J	USS8267G
DECODER/DEMULTIPLEXER							
4-line-to-16-line Decoder/Demultiplexer	24	US74154A	US54154A	US74154H	US54154H	US54154J	US54154G
SHIFT REGISTERS:							
8-Bit Shift Register	14	US7491A	US5491A	US7491H	US5491H	US5491J	US5491G
4-Bit Shift Register	16	US7494A	US5494A	US7494H	US5494H	US5494J	US5494G
4-Bit Right-Shift Left-Shift Register	14	US7495A	US5495A	US7495H	US5495H	US5495J	US5495G
5-Bit Shift Register	16	US7496A	US5496A	US7496H	US5496H	US5496J	US5496G
4-Bit Shift Register	14	USN8270A	USS8270A	USN8270H	USS8270H	USS8270J	USS8270G
4-Bit Shift Register	16	USN8271A	USS8271A	USN8271H	USS8271H	USS8271J	USS8271G

STANDARD TTL LOGIC

- Diode clamping on all inputs
- Totem pole output
- Low power dissipation
- High noise margin—1 Volt
- High fan-out
- Excellent capacitance-driving capability
- Multiple circuit functions per package

RECOMMENDED OPERATING CONDITIONS

Supply Voltage V_{CC}:
Series US5400/USS9600 . . . . . 5 Volts ± 10%
Series US7400/USN9600 . . . . . 5 Volts ± 5%
Operating Temperature Range:
Series US5400/USS9600 . . . . . −55 C to +125 C
Series US7400/USN9600 . . . . . 0 C to +70 C

DEVICE DESCRIPTION	Pins Per Pkg.	DUAL IN-LINE PACKAGE "A" PACKAGE 0 to +70°C	DUAL IN-LINE PACKAGE "A" PACKAGE −55 to +125°C	DUAL IN-LINE PACKAGE "H" PACKAGE 0 to +70°C	DUAL IN-LINE PACKAGE "H" PACKAGE −55 to +125°C	FLAT-PACK PACKAGE "J" PACKAGE −55 to +125°C	FLAT-PACK PACKAGE "G" PACKAGE −55 to +125°C
NAND GATES:							
Quad 2-Input NAND Gate	14	US7400A	US5400A	US7400H	US5400H	US5400J	US5400G
Quad 2-Input NAND Gate-Open Collector Output	14	US7401A	US5401A	US7401H	US5401H	US5401J	US5401G
Quad 2-Input NAND Gate-Open Collector Output	14	US7403A	US5403A	US7403H	US5403H	—	—
Triple 3-Input NAND Gate	14	US7410A	US5410A	US7410H	US5410H	US5410J	US5410G
Dual 4-Input NAND Gate	14	US7420A	US5420A	US7420H	US5420H	US5420J	US5420G
Single 8-Input NAND Gate	14	US7430A	US5430A	US7430H	US5430H	US5430J	US5430G
AND GATES:							
Quad 2-Input AND Gate	14	US7408A	US5408A	US7408H	US5408H	US5408J	US5408G
Quad 2-Input AND Gate – Open Collector Output	14	US7409A	US5409A	US7409H	US5409H	US5409J	US5409G
Triple 3-Input AND Gate	14	US7411A	US5411A	US7411H	US5411H	US5411J	US5411G
NOR GATES:							
Quad 2-Input NOR Gate	14	US7402A	US5402A	US7402H	US5402H	US5402J	US5402G
Triple 3-Input NOR Gate	14	US7427A	US5427A	US7427H	US5427H	US5427J	US5427G
Dual 4-Input NOR Gate	14	US7429A	US5429A	US7429H	US5429H	US5429J	US5429G
OR GATES:							
Triple 3-Input OR Gate	14	US7418A	US5418A	US7418H	US5418H	US5418J	US5418G
Quad 2-Input OR Gate	14	US7432A	US5432A	US7432H	US5432H	US5432J	US5432G
INVERTER GATES:							
Hex Inverter	14	US7404A	US5404A	US7404H	US5404H	US5404J	US5404G
Hex Inverter – Open Collector Output	14	US7405A	US5405A	US7405H	US5405H	US5405J	US5405G
AND-OR-INVERT GATES:							
Expandable Dual 2-Wide, 2-Input AND-OR-INVERT Gate	14	US7450A	US5450A	US7450H	US5450H	US5450J	US5450G
Dual 2-Wide, 2-Input AND-OR-INVERT Gate	14	US7451A	US5451A	US7451H	US5451H	US5451J	US5451G
Expandable 4-Wide, 2-Input AND-OR-INVERT Gate	14	US7453A	US5453A	US7453H	US5453H	US5453J	US5453G
4-Wide, 2-Input AND-OR-INVERT Gate	14	US7454A	US5454A	US7454H	US5454H	US5454J	US5454G
Dual 2-Wide, 2-3-Input AND-OR-INVERT Gate	14	US7459A	US5459A	US7459H	US5459H	US5459J	US5459G
BUFFER/DRIVER GATES:							
* Hex Inverter Buffer/Driver – Open Collector Output	14	US7416A	US5416A	US7416H	US5416H	US5416J	US5416G
* Hex Buffer/Driver – Open Collector Output	14	US7417A	US5417A	US7417H	US5417H	US5417J	US5417G
Quadruple 2-Input High Voltage Interface NAND Gate	14	US7426A	US5426A	US7426H	US5426H	—	—
* Quad 2-Input NAND Buffer Gate	14	US7437A	US5437A	US7437H	US5437H	US5437J	US5437G
Quad 2-Input NAND Buffer Gate – Open Collector Output	14	US7438A	US5438A	US7438H	US5438H		
Quad 2-Input NAND Buffer Gate-Open Collector Output	14	US7438-1A	US5438-1A	US7438-1H	US5438-1H	—	—
Quad 2-Input NAND Buffer Gate – Open Collector Output	14	US7439A	US5439A	US7439H	US5439H	US5439J	US5439G
Dual 4-Input NAND Buffer Gate	14	US7440A	US5440A	US7440H	US5440H	US5440J	US5440G
LOGIC INPUT EXPANDERS:							
Dual 4-Wide Expander Gate;	14	US7460A	US5460A	US7460H	US5460H	US5460J	US5460G
FLIP-FLOPS:							
D-C Clocked J-K Flip-Flop	14	US7470A	US5470A	US7470H	US5470H	US5470J	US5470G
J-K Master-Slave Flip-Flop	14	US7472A	US5472A	US7472H	US5472H	US5472J	US5472G
Dual J-K Master-Slave Flip-Flop	14	US7473A	US5473A	US7473H	US5473H	US5473J	US5473G
Dual D-Type Edge Triggered Flip-Flop	14	US7474A	US5474A	US7474H	US5474H	US5474J	US5474G
Dual J-K Master-Slave Flip-Flop with S_D and R_D	16	US7476A	US5476A	US7476H	US5476H	US5476J	US5476G
Dual J-K Master-Slave Flip-Flop	14	US74107A	US54107A	US74107H	US54107H	—	—
MONOSTABLE MULTIVIBRATORS:							
Monostable Multivibrator	14	US74121A	US54121A	US74121H	US54121H	US54121J	US54121G
Retriggerable Monostable Multivibrator with CLEAR	14	US74122A	US54122A	US74122H	US54122H	US54122J	US54122G
Dual Retriggerable Monostable Multivibrator with CLEAR	16	US74123A	US54123A	US74123H	US54123H	US54123J	US54123G
Retriggerable Monostable Multivibrator	14	USN9601A	USS9601A	USN9601H	USS9601H	USS9601J	USS9601G

HIGH-SPEED TTL LOGIC

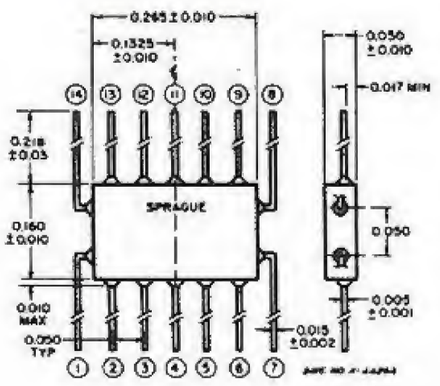
- Diode clamping on all inputs – No "line ringing" problems.
- Low power dissipation
- High noise margin – 1 Volt
- High fan-out
- Excellent capcitance-driving capability
- Multiple circuit functions per package

RECOMMENDED OPERATING CONDITIONS

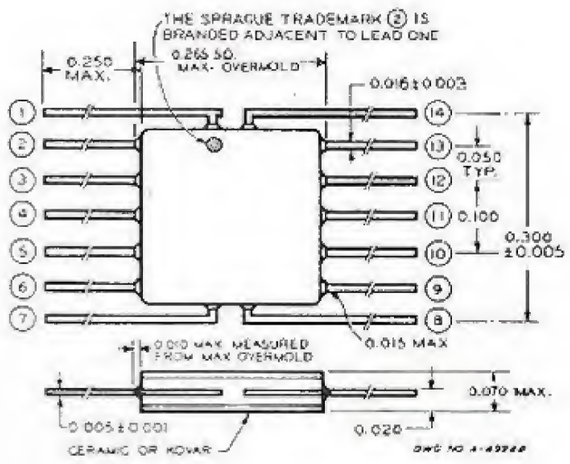
Supply Voltage V_{CC}:
Series US54H00 . . . . . 5 Volts ± 10%
Series US74H00 . . . . . 5 Volts ±5%
Operating Temperature Range:
Series US54H00 . . . . . −55 C to +125 C
Series US74H00 . . . . . 0 C to +70 C

DEVICE DESCRIPTION	Pins per Pkg.	DUAL IN-LINE PACKAGE				FLAT-PACK PACKAGE	
		"A" PACKAGE		"H" PACKAGE		"J" PACKAGE	"G" PACKAGE
		0 to +70°C	−55 to +125°C	0 to +70°C	−55 to +125°C	−55 to +125°C	−55 to +125°C
NAND GATES:							
Quad 2-Input NAND Gate	14	US74H00A	US54H00A	US74H00H	US54H00H	US54H00J	US54H00G
Quad 2-Input NAND Gate-Open Collector Output	14	US74H01A	US54H01A	US74H01H	US54H01H	US54H01J	US54H01G
Triple 3-Input NAND Gate	14	US74H10A	US54H10A	US74H10H	US54H10H	US54H10J	US54H10G
Dual 4-Input NAND Gate	14	US74H20A	US54H20A	US74H20H	US54H20H	US54H20J	US54H20G
Dual 4-Input NAND Gate-Open Collector Output	14	US74H22A	US54H22A	US74H22H	US54H22H	US54H22J	US54H22G
Single 8-Input NAND Gate	14	US74H30A	US54H30A	US74H30H	US54H30H	US54H30J	US54H30G
AND GATES:							
Quad 2-Input AND Gate	14	US74H08A	US54H08A	US74H08H	US54H08H	US54H08J	US54H08G
Triple 3-Input AND Gate	14	US74H11A	US54H11A	US74H11H	US54H11H	US54H11J	US54H11G
Dual 4-Input AND Gate	14	US74H21A	US54H21A	US74H21H	US54H21H	US54H21J	US54H21G
INVERTER GATES:							
Hex Inverter	14	US74H04A	US54H04A	US74H04H	US54H04H	US54H04J	US54H04G
Hex Inverter-Open Collector Output	14	US74H05A	US54H05A	US74H05H	US54H05H	US54H05J	US54H05G
AND-OR GATES:							
Expandable 4-Wide 2-2-2-3 Input AND-OR Gate	14	US74H52A	US54H52A	US74H52H	US54H52H	US54H52J	US54H52G
AND-OR-INVERT GATES:							
Expandable Dual 2-Wide, 2-Input AND-OR-INVERT GATE	14	US74H50A	US54H50A	US74H50H	US54H50H	US54H50J	US54H50G
Dual 2-Wide, 2-Input AND-OR-INVERT Gate	14	US74H51A	US54H51A	US74H51H	US54H51H	US54H51J	US54H51G
Expandable 4-Wide 2-2-2-3 Input AND-OR-INVERT GATE	14	US74H53A	US54H53A	US74H53H	US54H53H	US54H53J	US54H53G
4-Wide 2-2-2-3 Input AND-OR-INVERT Gate	14	US74H54A	US54H54A	US74H54H	US54H54H	US54H54J	US54H54G
Expandable 2-Wide, 4-Input AND-OR-INVERT Gate	14	US74H55A	US54H55A	US74H55H	US54H55H	US54H55J	US54H55G
BUFFER GATES:							
Quad 2-Input Buffer NAND Gate	14	US74H37A	US54H37A	US74H37H	US54H37H	US54H37J	US54H37G
Quad 2-Input Buffer NAND Gate – Open Collector Output	14	US74H38A	US54H38A	US74H38H	US54H38H	US54H38J	US54H38G
Dual 4-Input Buffer NAND Gate	14	US74H40A	US54H40A	US74H40H	US54H40H	US54H40J	US54H40G
EXPANDER GATES:							
Dual 4-Input Expander for AND-OR-INVERT Gate	14	US74H60A	US54H60A	US74H60H	US54H60H	US54H60J	US54H60G
Triple 3-Input Expander for AND-OR Gate	14	US74H61A	US54H61A	US74H61H	US54H61H	US54H61J	US54H61G
3-2-2-3 Input AND-OR Expander for AND-OR-INVERT GATE	14	US74H62A	US54H62A	US74H62H	US54H62H	US54H62J	US54H62G
FLIP-FLOPS:							
J-K Flip-Flop with AND-OR Inputs	14	US74H71A	US54H71A	US74H71H	US54H71H	US54H71J	US54H71G
J-K Master-Slave Flip-Flop	14	US74H72A	US54H72A	US74H72H	US54H72H	US54H72J	US54H72G
Dual J-K Master-Slave Flip-Flop	14	US74H73A	US54H73A	US74H73H	US54H73H	US54H73J	US54H73G
Dual D-Type Edge Triggered Flip-Flop	14	US74H74A	US54H74A	US74H74H	US54H74H	US54H74H	US54H74G
Dual J-K Master-Slave Flip-Flop with S_D and R_D	16	US74H76A	US74H76A	US74H76H	US54H76H	US54H76J	US54H76G
Dual J-K Master-Slave Flip-Flop with Common CLOCK and Common CLEAR	14	US74H78A	US54H78A	US74H78A	US54H78H	US54H78J	US54H78G
50 MHz AND-OR Input J-K Flip-Flop	14	US74H571A	US54H571A	US74H571H	US54H571H	US54H571J	US54H571G
50 MHz AND Input J-K Flip-Flop	14	US74H572A	US54H572A	US74H572H	US54H572H	US54H572J	US54H572G

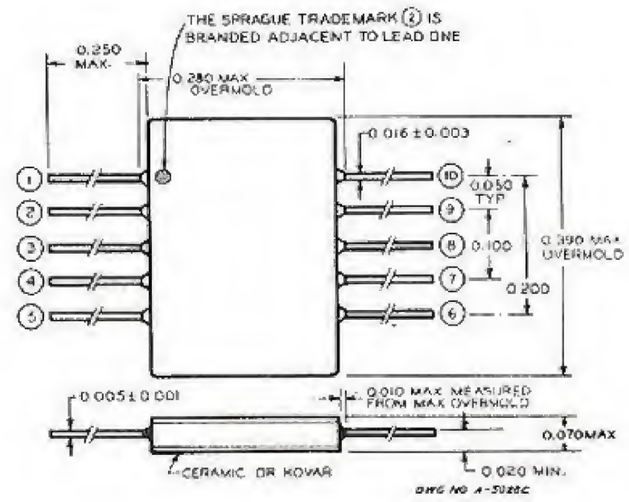
PACKAGE DATA



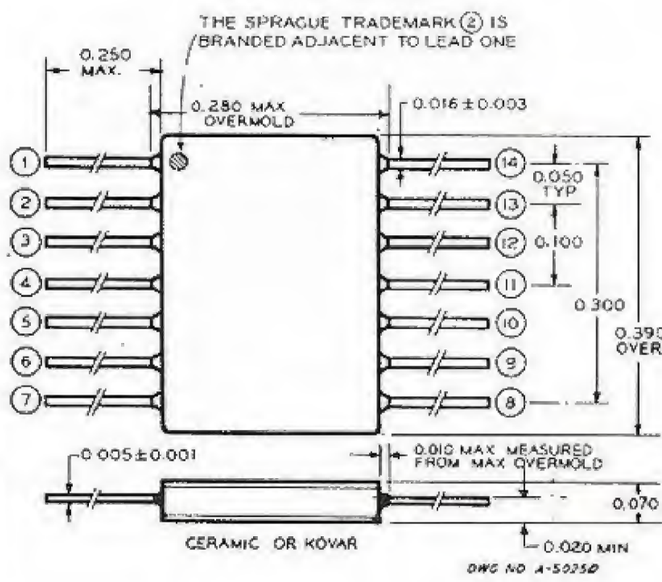
14-PIN HERMETIC FLAT-PACK (TO-85)
PACKAGE AC



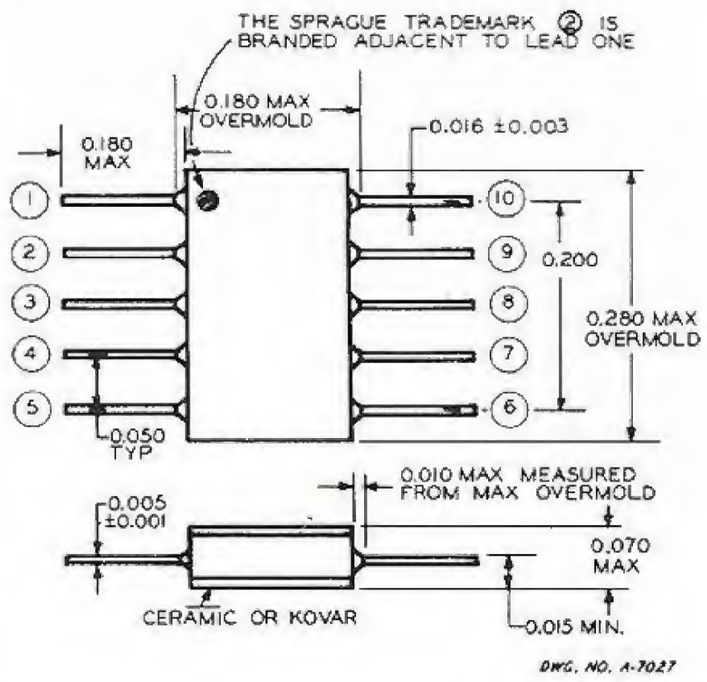
14-PIN HERMETIC FLAT-PACK (TO-86)
PACKAGE AF



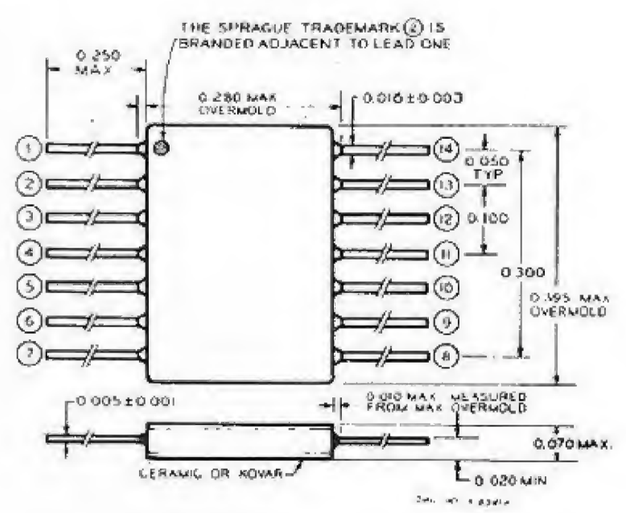
10-PIN HERMETIC FLAT-PACK (TO-87)
PACKAGE AH



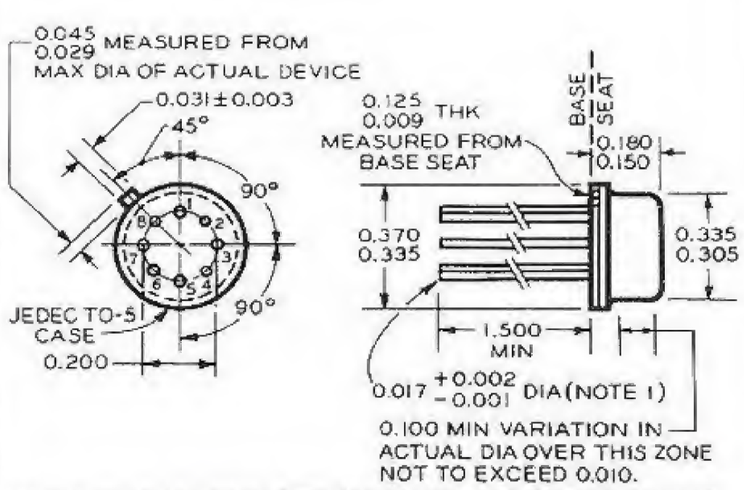
14-PIN HERMETIC FLAT-PACK (TO-87)
PACKAGE AI



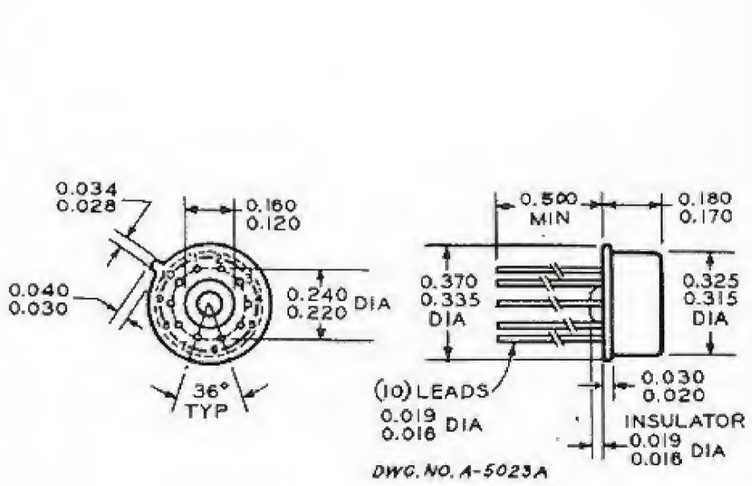
10-PIN HERMETIC FLAT-PACK (TO-90)
PACKAGE AN



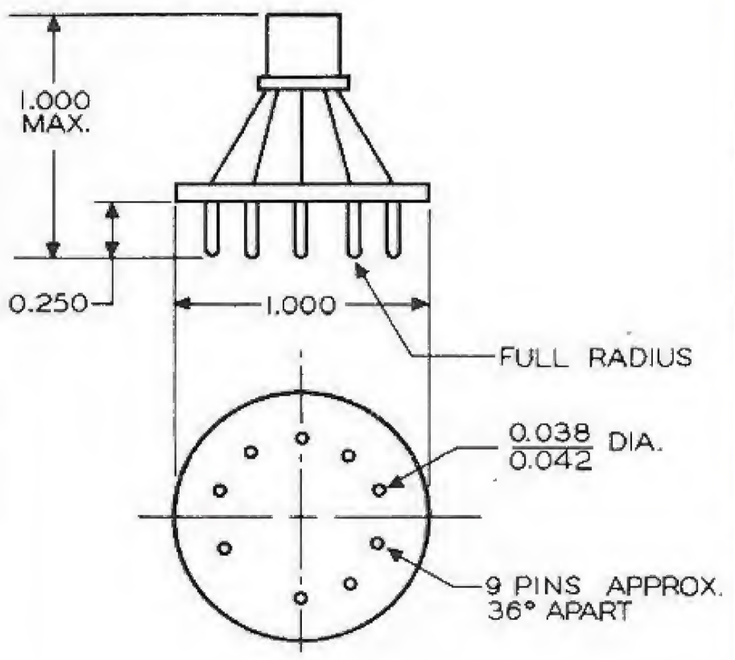
14-PIN HERMETIC FLAT-PACK (TO-87)
PACKAGE AM



8-PIN METAL CAN (TO-78)
PACKAGE BD

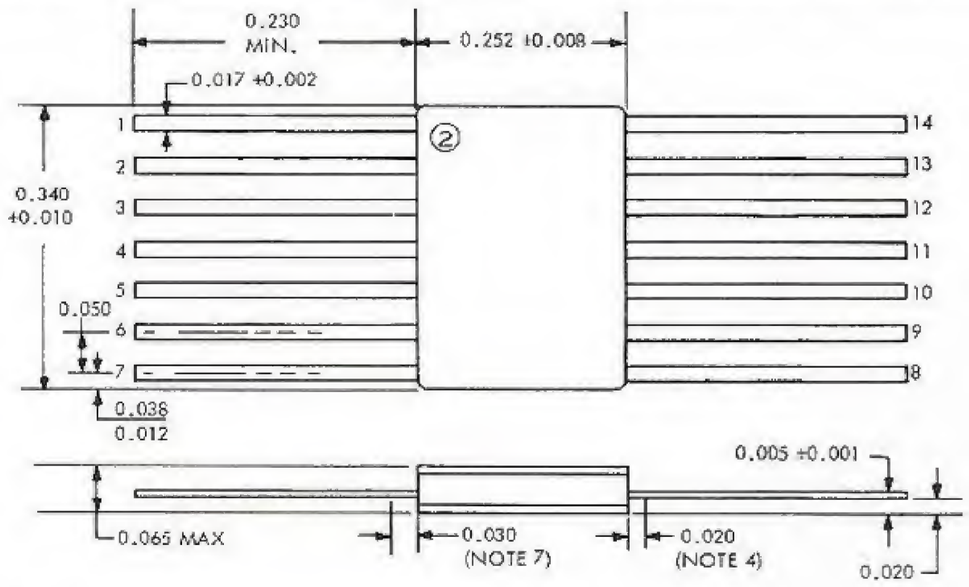


10-PIN METAL CAN (TO-100)
PACKAGE BK



ADAPTER WAFER PACKAGE KW

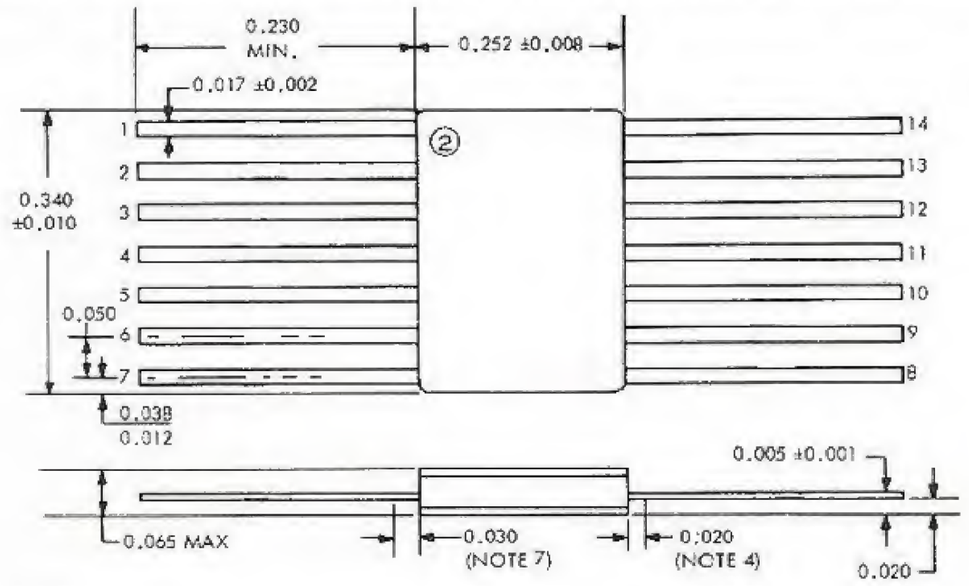
PACKAGE DATA (continued)



NOTES:
1. LEAD MATERIAL, *F-15, GOLD PLATED.
2. BODY MATERIAL, CERAMIC BOTTOM WITH GLASS SEALS.
3. LID MATERIAL, *F-15, GOLD PLATED WITH BRAZE SEAL.
4. LEAD SPACING DIMENSIONS APPLY TO THIS AREA ONLY.
5. SPACING TOLERANCES NON-CUMULATIVE.
6. MAXIMUM GLASS CLIMB 0.010 ALLOWED ON LEADS (2 SIDES).
7. RECOMMENDED MINIMUM OFFSET BEFORE LEAD BEND

*F-15 is the ASTM designation for an iron, nickel, cobalt alloy consisting of 53% iron, 29% nickel, and 17% cobalt.

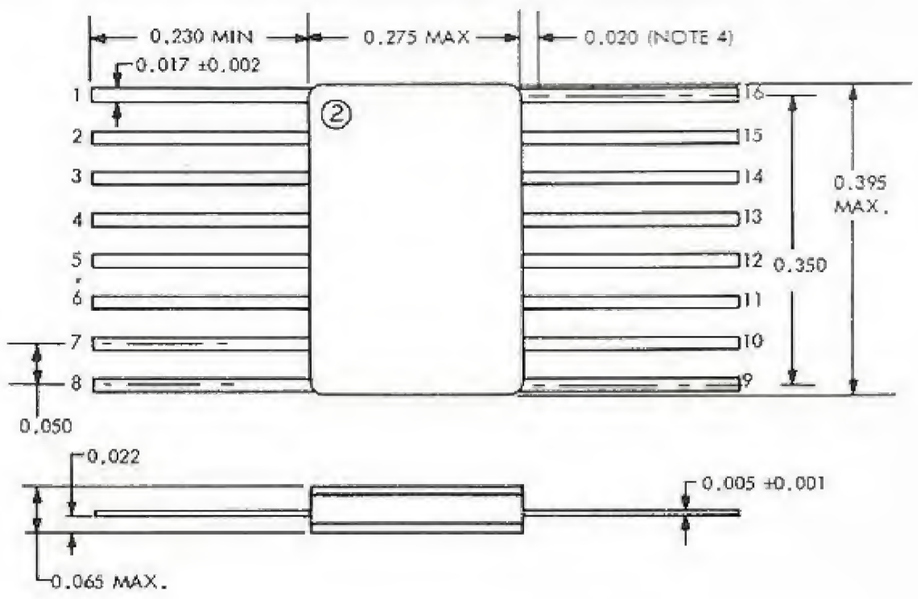
14-PIN CERAMIC HERMETIC FLAT-PACK (TO-88) PACKAGE AG



NOTES:
1. LEAD MATERIAL, *F-15, GOLD PLATED.
2. BODY MATERIAL, *F-15 BOTTOM, GOLD PLATED, WITH GLASS SEALS.
3. LID MATERIAL, *F-15, GOLD PLATED WITH BRAZE SEAL.
4. LEAD SPACING DIMENSIONS APPLY TO THIS AREA ONLY.
5. SPACING TOLERANCES NON-CUMULATIVE.
6. MAXIMUM GLASS CLIMB 0.010 ALLOWED ON LEADS (2 SIDES).
7. RECOMMENDED MINIMUM OFFSET BEFORE LEAD BEND

*F-15 is the ASTM designation for an iron, nickel, cobalt alloy consisting of 53% iron, 29% nickel, and 17% cobalt.

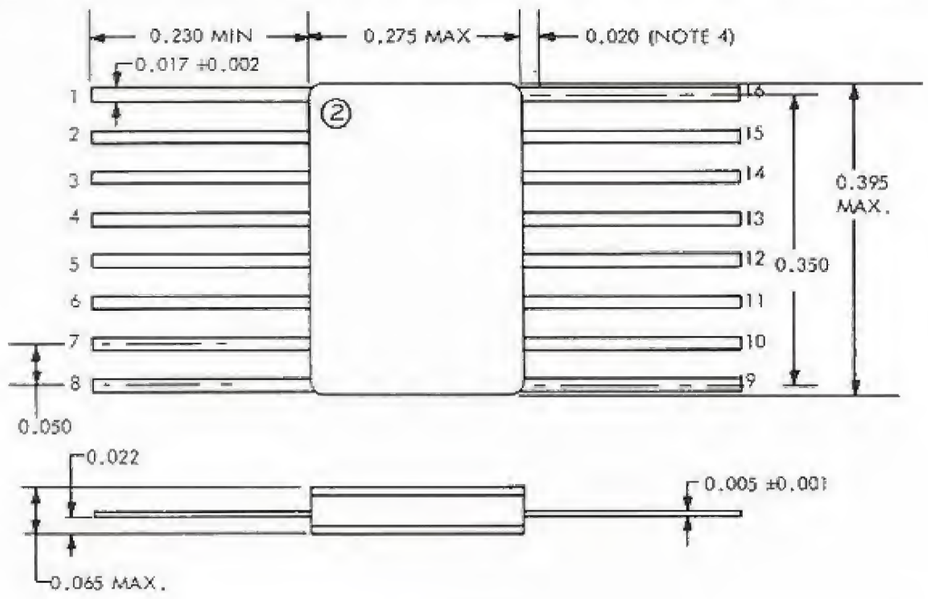
14-PIN METAL BOTTOM HERMETIC FLAT-PACK PACKAGE AJ



NOTES:
1. LEAD MATERIAL, *F-15, GOLD PLATED.
2. BODY MATERIAL, CERAMIC BOTTOM WITH GLASS SEALS.
3. LID MATERIAL, *F-15 GOLD PLATED WITH BRAZE SEAL.
4. LEAD SPACING DIMENSIONS APPLY TO THIS AREA ONLY.
5. SPACING TOLERANCES NON-CUMULATIVE.
6. MAXIMUM GLASS CLIMB 0.010 ALLOWED ON LEADS (4 SIDES).

*F-15 is the ASTM designation for an iron, nickel, cobalt alloy consisting of 53% iron, 29% nickel, and 17% cobalt.

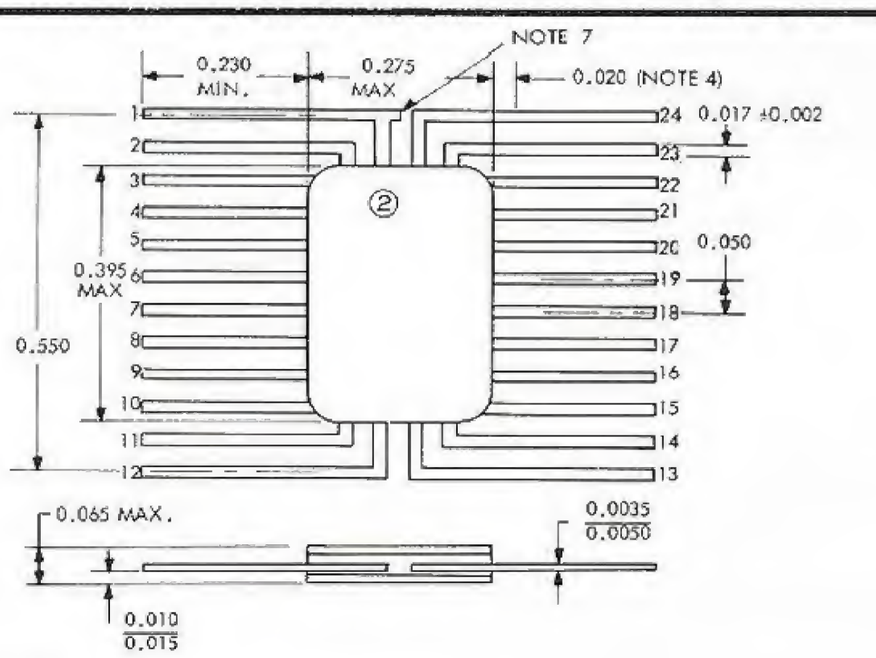
16-PIN CERAMIC HERMETIC FLAT-PACK PACKAGE AG



NOTES:
1. LEAD MATERIAL, *F-15, GOLD PLATED.
2. BODY MATERIAL, *F-15 BOTTOM, GOLD PLATED, WITH GLASS SEALS.
3. LID MATERIAL, *F-15 GOLD PLATED WITH BRAZE SEAL.
4. LEAD SPACING DIMENSIONS APPLY TO THIS AREA ONLY.
5. SPACING TOLERANCES NON-CUMULATIVE.
6. MAXIMUM GLASS CLIMB 0.010 ALLOWED ON LEADS (4 SIDES).

*F-15 is the ASTM designation for an iron, nickel, cobalt alloy consisting of 53% iron, 29% nickel, and 17% cobalt.

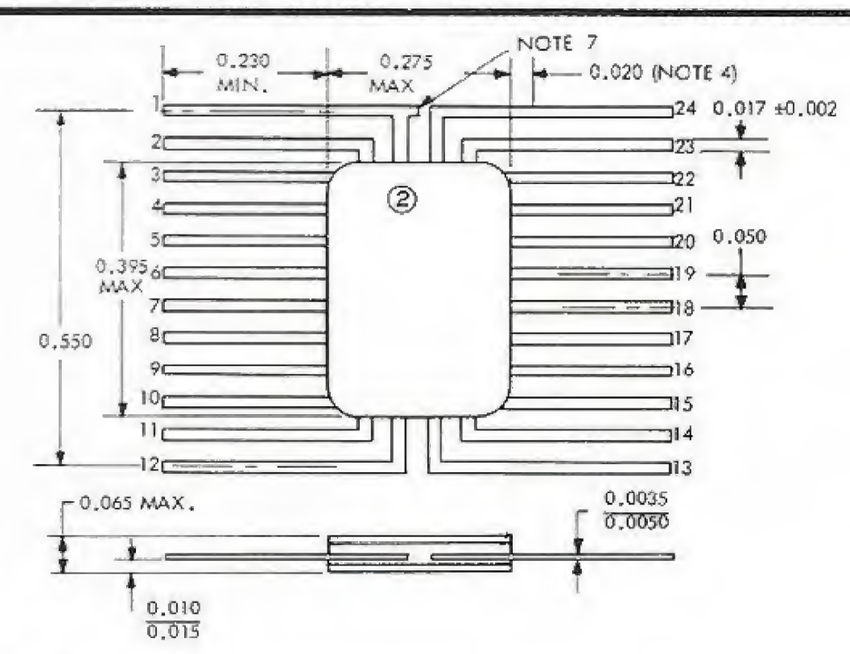
16-PIN METAL BOTTOM HERMETIC FLAT-PACK PACKAGE AJ



NOTES:
1. LEAD MATERIAL, *F-15, GOLD PLATED.
2. BODY MATERIAL, CERAMIC BOTTOM WITH GLASS SEALS
3. LID MATERIAL, *F-15 GOLD PLATED WITH BRAZE SEAL.
4. LEAD SPACING DIMENSIONS APPLY TO THIS AREA ONLY
5. SPACING TOLERANCES NON-CUMULATIVE.
6. MAXIMUM GLASS CLIMB 0.010 ALLOWED ON LEADS (4 SIDES)
7. EXTENSION DENOTES LEAD NO. 1.

*F-15 is the ASTM designation for an iron, nickel, cobalt alloy consisting of 53% iron, 29% nickel, and 17% cobalt.

24-PIN CERAMIC HERMETIC FLAT-PACK PACKAGE AG

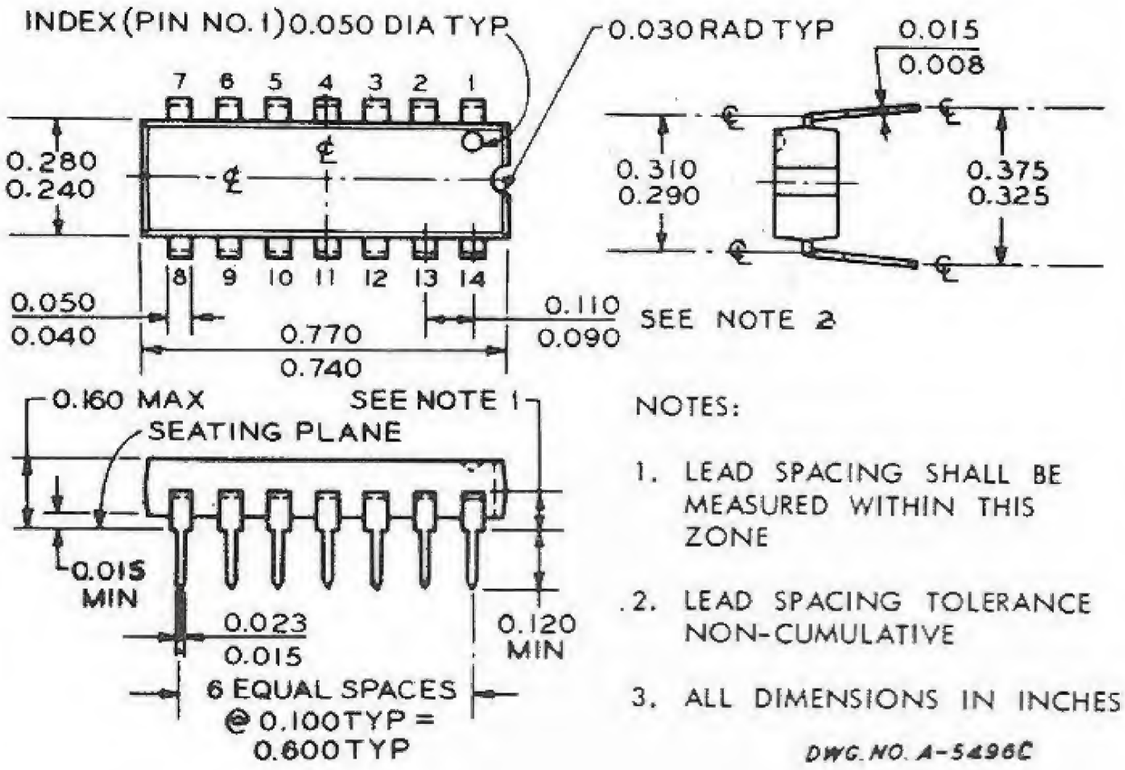


NOTES:
1. LEAD MATERIAL, *F-15, GOLD PLATED.
2. BODY MATERIAL, *F-15 BOTTOM, GOLD PLATED, WITH GLASS SEALS.
3. LID MATERIAL, *F-15 GOLD PLATED WITH BRAZE SEAL.
4. LEAD SPACING DIMENSIONS APPLY TO THIS AREA ONLY
5. SPACING TOLERANCES NON-CUMULATIVE.
6. MAXIMUM GLASS CLIMB 0.010 ALLOWED ON LEADS (4 SIDES)
7. EXTENSION DENOTES LEAD NO. 1.

*F-15 is the ASTM designation for an iron, nickel, cobalt alloy consisting of 53% iron, 29% nickel, and 17% cobalt.

24-PIN METAL BOTTOM HERMETIC FLAT-PACK PACKAGE AJ

PACKAGE DATA (continued)

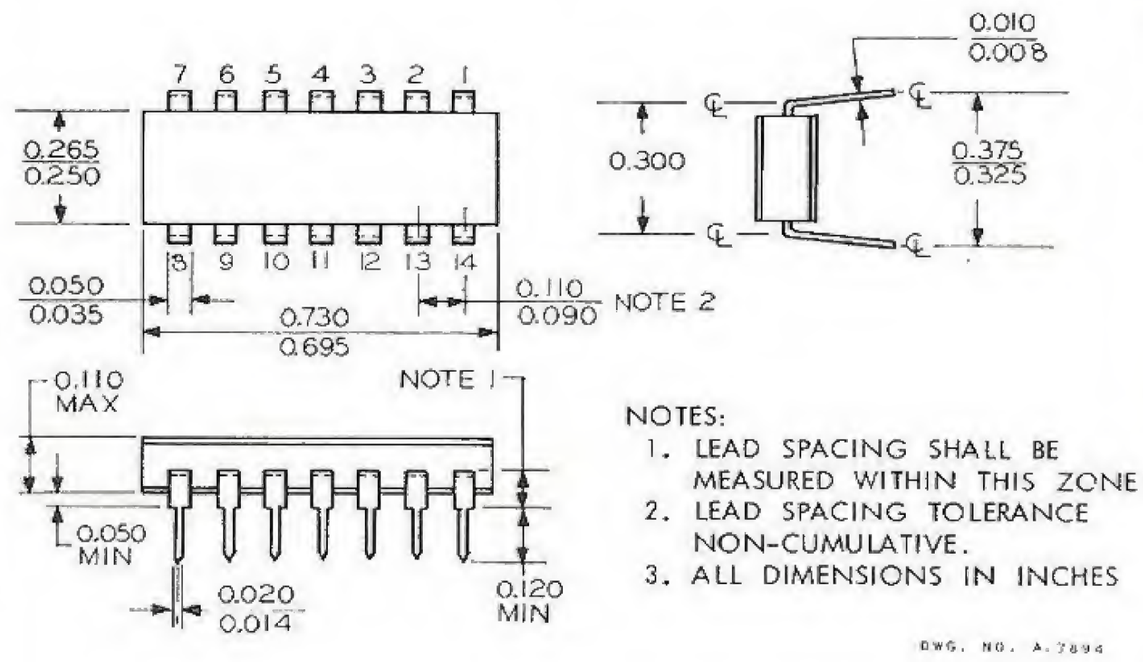


NOTES:

1. LEAD SPACING SHALL BE MEASURED WITHIN THIS ZONE
2. LEAD SPACING TOLERANCE NON-CUMULATIVE
3. ALL DIMENSIONS IN INCHES

DWG. NO. A-5496C

14-PIN DUAL IN-LINE PLASTIC PACKAGE EA

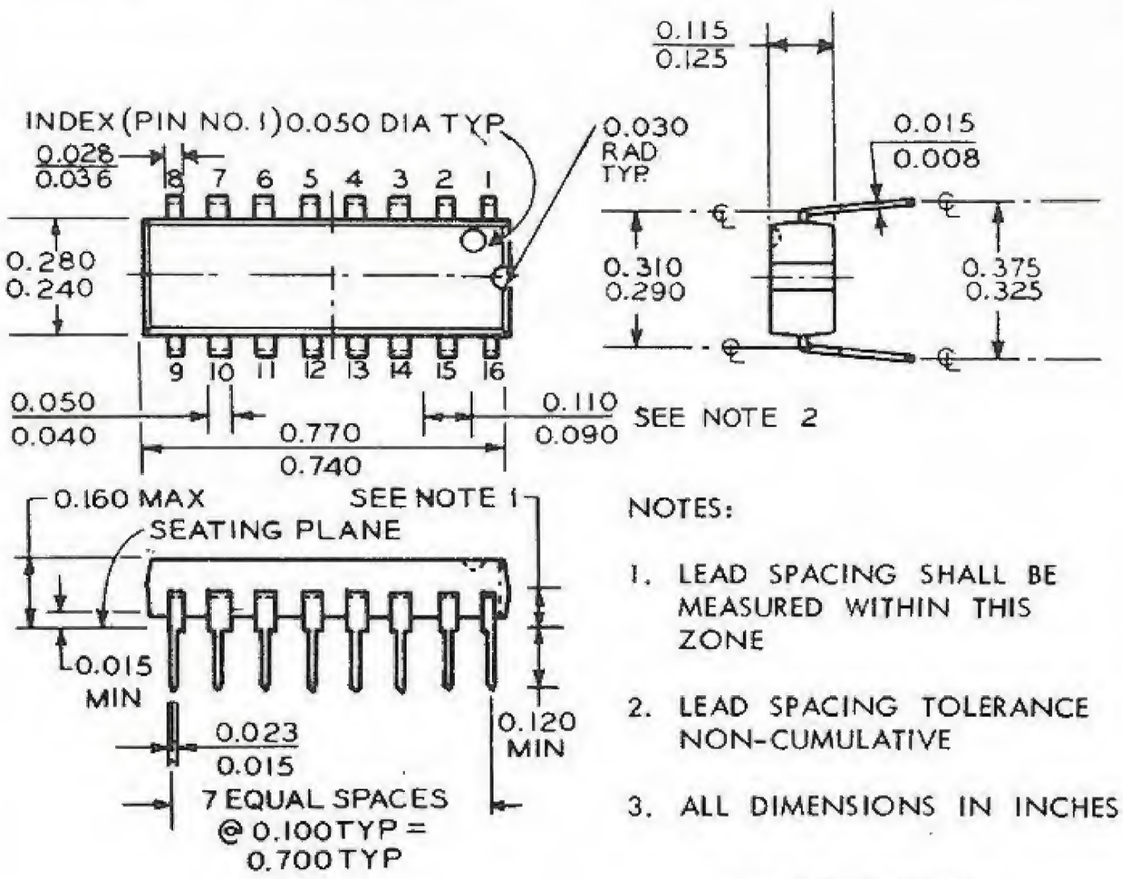


NOTES:

1. LEAD SPACING SHALL BE MEASURED WITHIN THIS ZONE
2. LEAD SPACING TOLERANCE NON-CUMULATIVE.
3. ALL DIMENSIONS IN INCHES

DWG. NO. A-7894

14-PIN DUAL IN-LINE CERAMIC PACKAGE EH

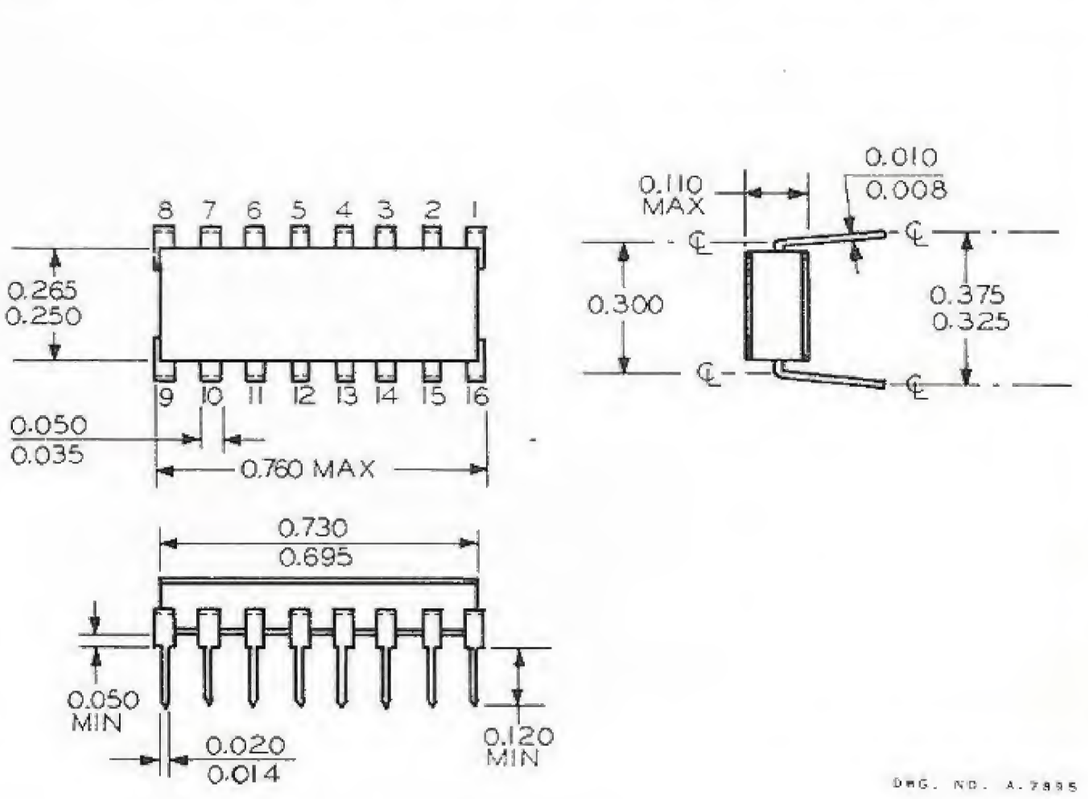


NOTES:

1. LEAD SPACING SHALL BE MEASURED WITHIN THIS ZONE
2. LEAD SPACING TOLERANCE NON-CUMULATIVE
3. ALL DIMENSIONS IN INCHES

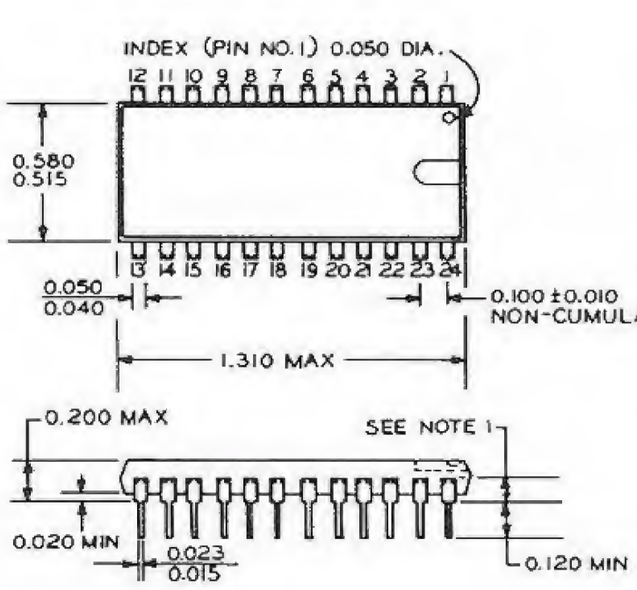
DWG. NO. A-6402A

16-PIN DUAL IN-LINE PLASTIC PACKAGE EA



DWG. NO. A-7895

16-PIN DUAL IN-LINE HERMETIC PACKAGE EH

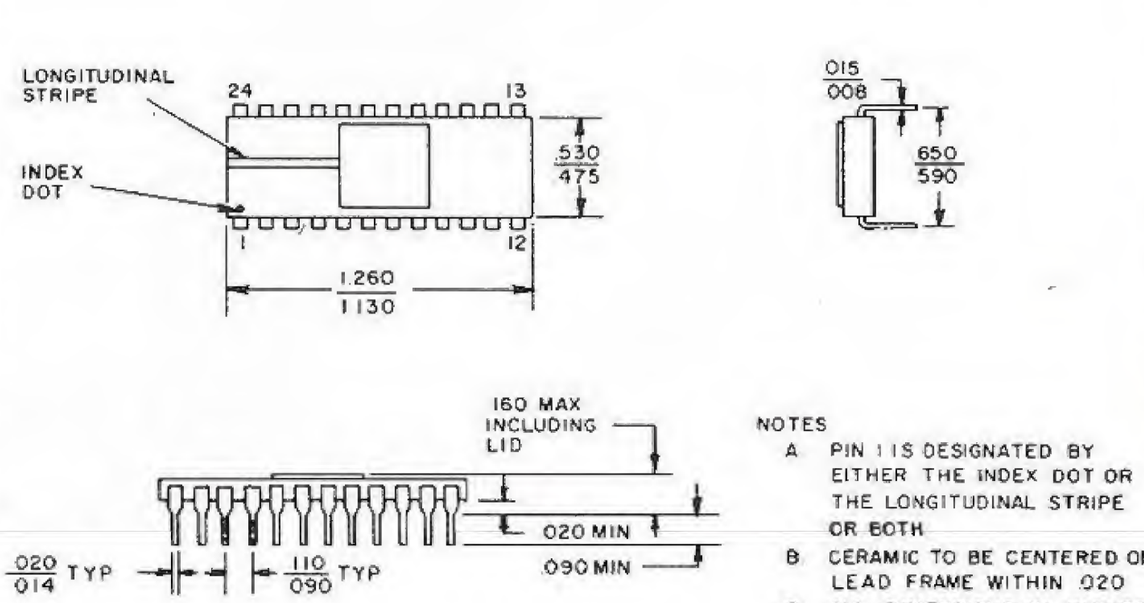


NOTES:

1. LEAD SPACING SHALL BE MEASURED WITHIN THIS ZONE.
2. ALL DIMENSIONS IN INCHES

DWG. NO. A-7270

24-PIN DUAL IN-LINE PLASTIC PACKAGE EA



NOTES

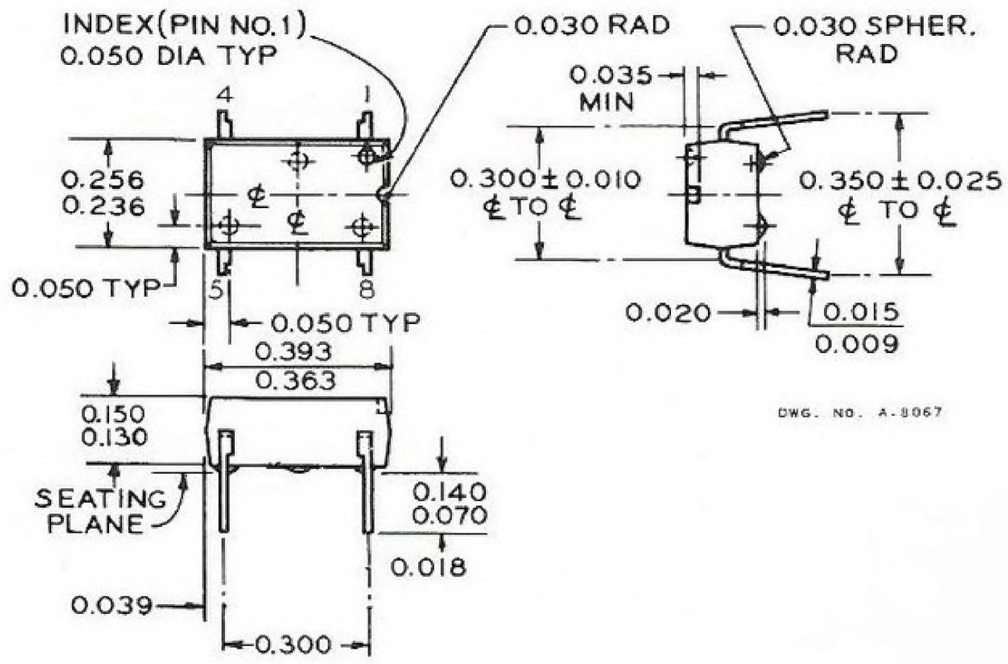
A. PIN 1 IS DESIGNATED BY EITHER THE INDEX DOT OR THE LONGITUDINAL STRIPE OR BOTH

B. CERAMIC TO BE CENTERED ON LEAD FRAME WITHIN .020

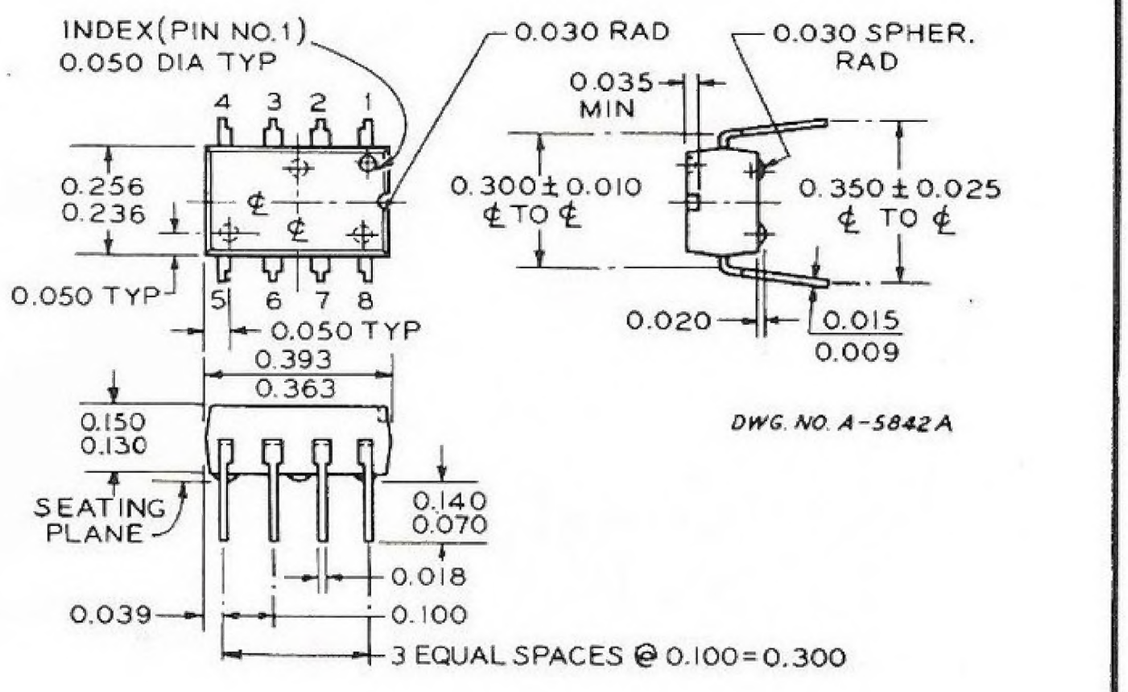
C. ALL DIMENSIONS IN INCHES

24-PIN DUAL IN-LINE HERMETIC PACKAGE EH

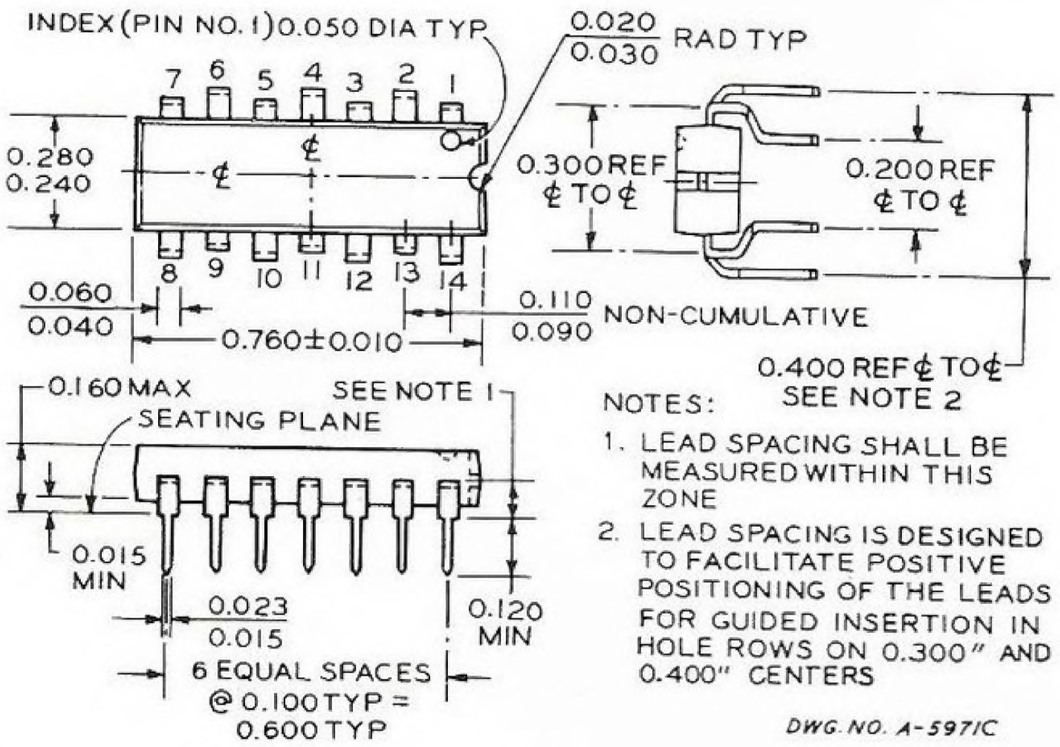
PACKAGE DATA (continued)



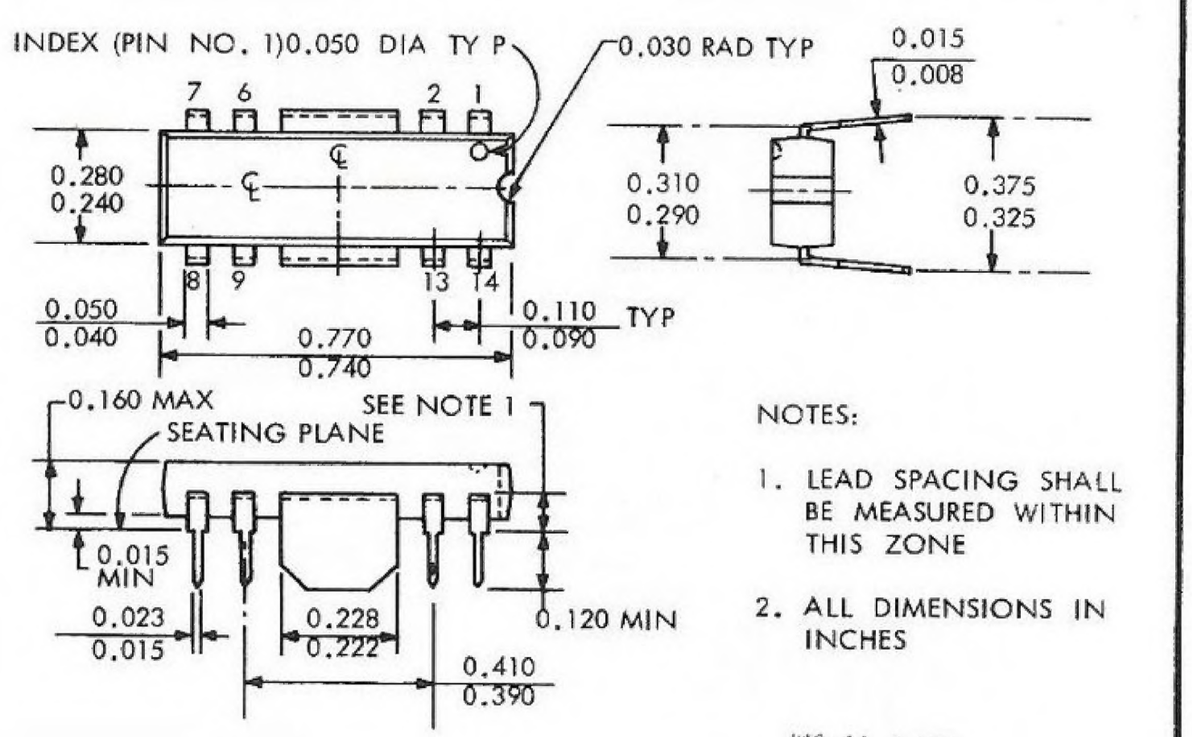
4-PIN PLASTIC PACKAGE EE



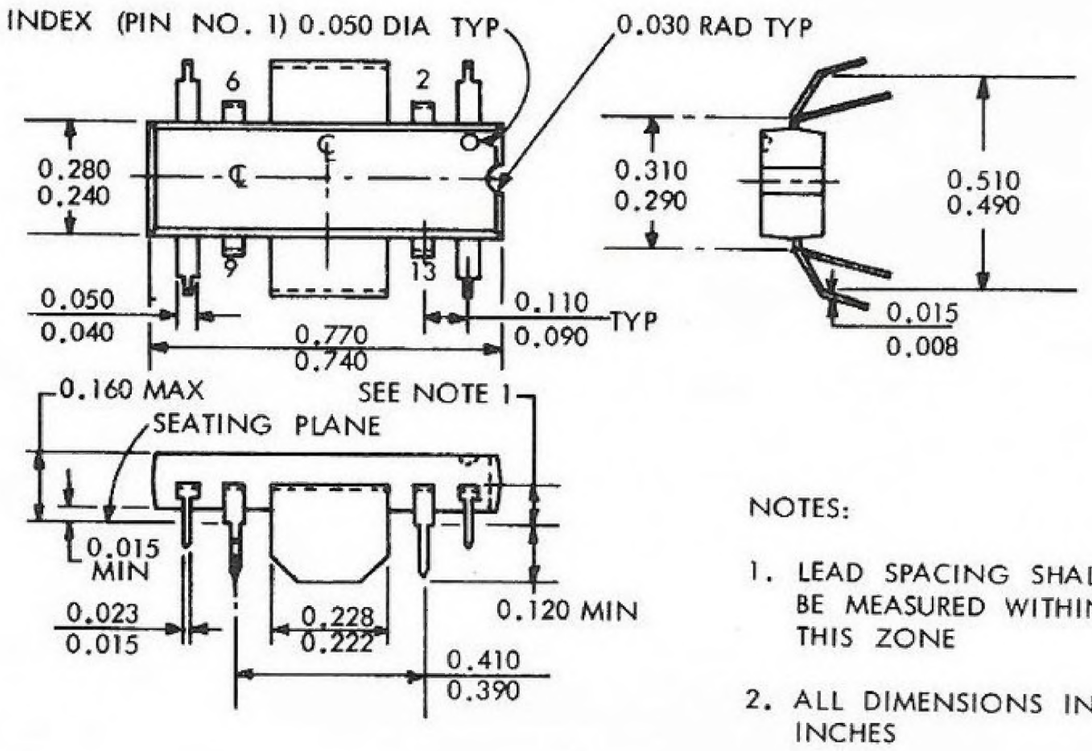
8-PIN DUAL IN-LINE PLASTIC PACKAGE EM



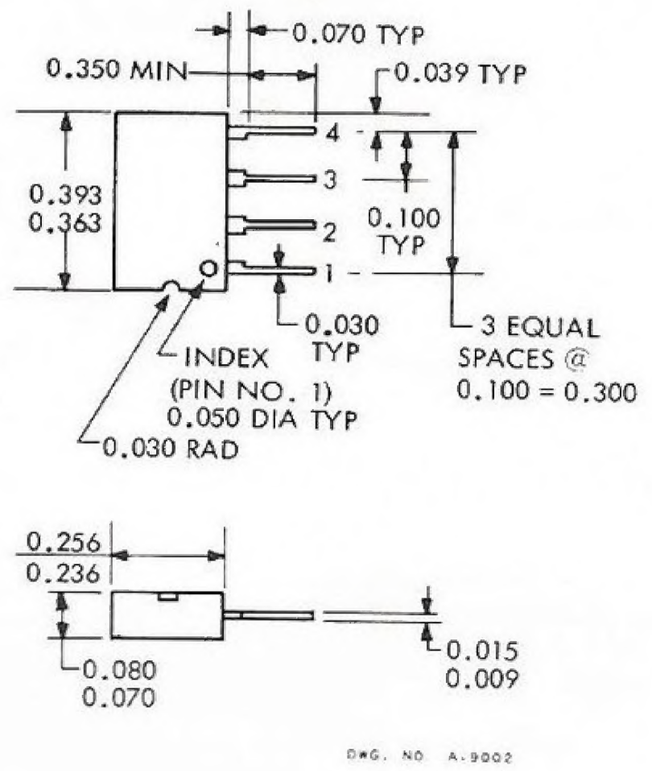
14-PIN QUAD IN-LINE PLASTIC PACKAGE EN



8-PIN + 2 TAB DUAL IN-LINE PLASTIC PACKAGE EP

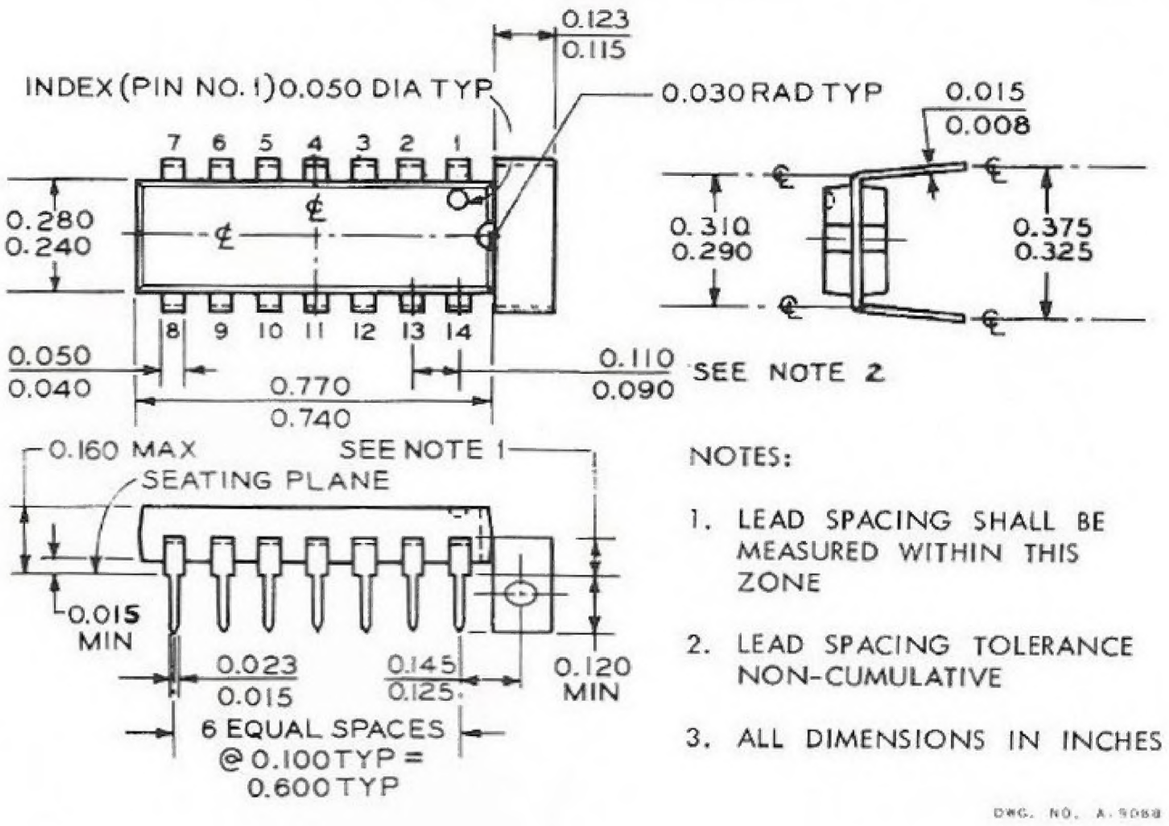


8-PIN + 2 TAB QUAD IN-LINE PLASTIC PACKAGE EQ



4-PIN SINGLE-ENDED PLASTIC PACKAGE ES

PACKAGE DATA (continued)

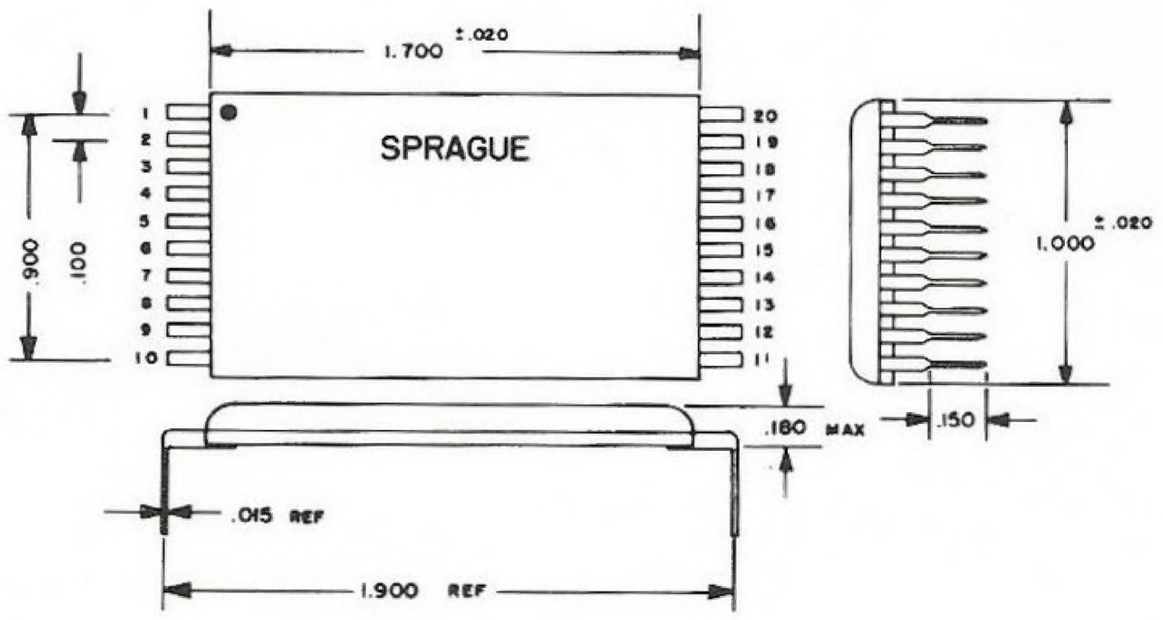


NOTES:

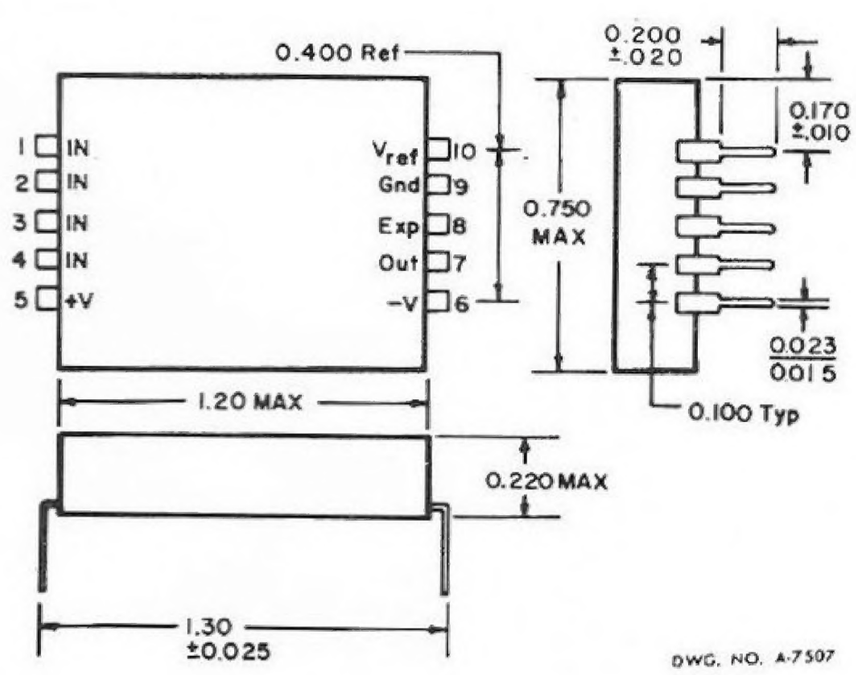
1. LEAD SPACING SHALL BE MEASURED WITHIN THIS ZONE
2. LEAD SPACING TOLERANCE NON-CUMULATIVE
3. ALL DIMENSIONS IN INCHES

DWG. NO. A-5068

14-PIN + 1 TAB PLASTIC PACKAGE ET

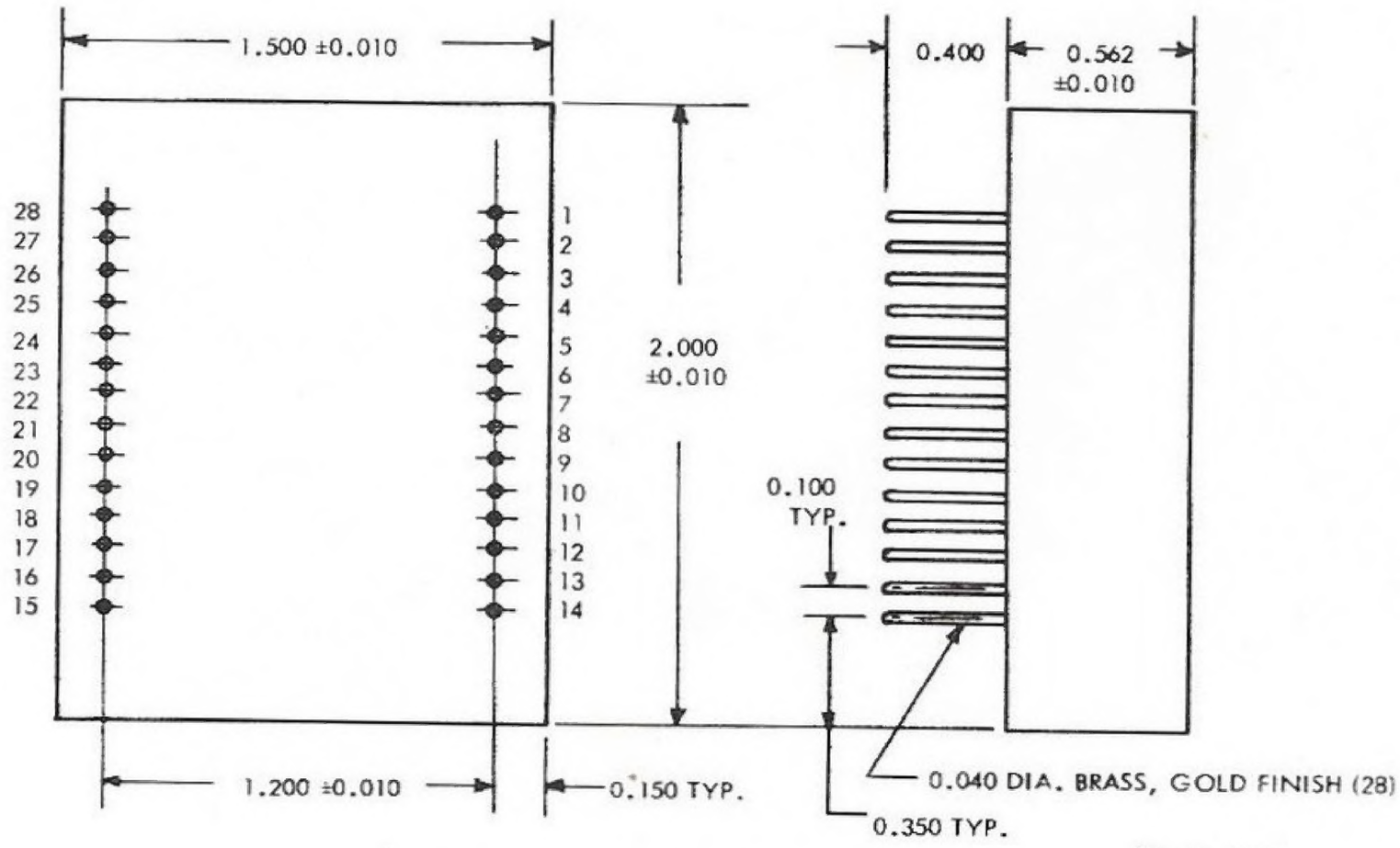


20-PIN MODULINE PACKAGE MA



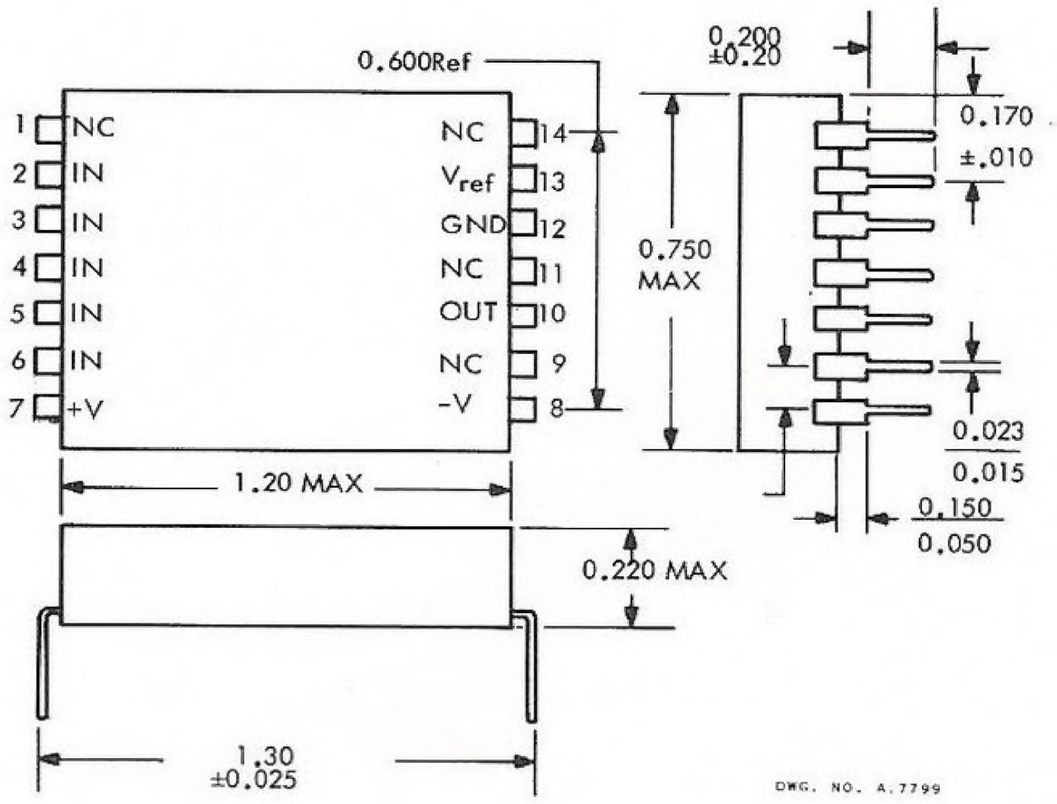
DWG. NO. A-7507

10-PIN MODULINE PACKAGE MB



28-PIN MODULINE PACKAGE ME

PACKAGE DATA (continued)



14-PIN MODULINE PACKAGE MF

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